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5. Impacts of Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas

5.1 Scope of Work

This planning effort is part of a consensus-based planning effort to include local concerns in the statewide water supply planning effort. This chapter presents the results of Task 5 of the project scope, which addresses:

- Impacts of Water Management Strategies on Key Parameters of Water Quality
- Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs
- Impacts of Moving Water from Rural and Agricultural Areas.

5.2 Impacts of Water Management Strategies on Key Parameters of Water Quality

The potential impacts that water management strategies may have on water quality are discussed in this section, including the identified water quality parameters which are deemed important to the use of the water resources within the region. Under the Clean Water Act, Texas must define designated uses for all major water bodies and, consequently, the water quality standards that are appropriate for that designated water body use. The water quality parameters which are listed for Region H below were selected based on the *TCEQ Water Quality Inventory for Designated Water Body Uses* as well as the water quality parameters identified in the Texas Commission on Environmental Quality (TCEQ) 303d list of impaired water bodies. For reference purposes, Appendix 5A contains the TCEQ 303d list of impaired waters within the region as well as the tabular summaries of use support for the water bodies that are part of Region H.

Key surface water parameters identified within Region H fall into two broad categories:

Nutrients and non-conservative substances:

- Bacteria
- pH
- Dissolved Oxygen
- Total Suspended Solids (TSS)
- Temperature
- Nutrients (Nitrogen, Phosphorus)

Minerals and conservative substances:

- Total Dissolved Solids (TDS)
- Chlorides
- Mercury
- Salinity
- Sediment Contaminants

Non-conservative substances are those parameters that undergo rapid degradation or change as the substance flows downstream, such as nutrients which are consumed by plant life. Nutrient and non-conservative loading to surface water originates from a variety of natural and man-made sources. One significant source of these loads is wastewater treatment facilities. As population increases, the number and size of these wastewater discharges will likely increase as well. Stormwater runoff from certain land use types constitutes another significant source of nutrient loading to the region's watercourses, including agricultural areas, golf courses, residential development, or other landscaped areas where fertilizers are applied. Nutrient loads in Region H are typically within the limits deemed acceptable for conventional water treatment facilities, and are therefore not considered a major concern as related to source of supply.

Conservative substances are those that do not undergo rapid degradation or do not change in water as the substance flows downstream, such as metals. Mineral and other conservative substance loading to surface water generally originates from three sources: (1) non-point source runoff or groundwater seepage from mineralized areas, either natural or man-made (2) wastewater discharges, and (3) sea water migration above estuaries. Region H is fortunate in that the first category is not typical of this area except for the Brazos River which has several natural salt-contributing areas, fortunately, flows in the lower basin generally are sufficient to dilute these sources to easily manageable concentrations. Wastewater discharges in general, and industrial discharges in particular, have improved over the past 30-years due to the requirements of the Clean Water Act. If local concentrations of conservative contaminants are identified, they are remediated by the appropriate agency. Salinity migration above estuaries is controlled in the Trinity River by the Wallisville Saltwater Barrier, and in the San Jacinto River by the Lake Houston Dam. This 2006 Region H Plan recommends a saltwater barrier be added above the Brazos estuary to protect water quality in that reach of the Brazos River as well.

Groundwater in Region H is generally of good quality with no usage limitations. Quality parameters of interest include Total Dissolved Solids (TDS), metals and hardness. Portions of the Carrizo-Wilcox aquifer can contain levels of iron that require sequestering or removal through treatment facilities. The Brazos River Alluvium is directly recharged from the based flow in the Brazos River, and has the potential to reflect any contaminant loading of the Brazos River. Portions of the aquifer currently experience elevated TDS and hardness.

Water quality of the Gulf Coast aquifer is generally good throughout the Region. The Chicot and Evangeline aquifers are capable of yielding moderate to large amounts of fresh water in most of the Region. Fresh water is overlain and underlain by saline water in coastal areas and the coastal deposits are not capable of yielding fresh water. Deeper formations throughout the region are able to supply limited freshwater and slightly saline water in updip areas.

Some localized sites within the Region have the potential to cause contamination of the aquifer under adverse conditions. These sites once generated surface water pollution which, if not properly handled, could cause contamination of local soils or shallow groundwater supplies. Except for the northern areas of the Region, the thickness of the near-surface clay soils located over much of the Region provide an effective barrier to deeper aquifer contamination due to normal infiltration. As a consequence, the primary risk for Gulf Coast aquifer groundwater contamination occurs if there are improperly designed or inadequately sealed wells which are exposed to this surface contamination. Localized shallow alluvial aquifers primarily located along the major streams such as the Brazos River are at greater risk for contamination from these sites as a result of the more direct travel paths for potential contaminated water to reach these areas, especially if they are being pumped by small household or livestock wells. At this time, there are no recorded incidents of contaminated groundwater in the Region as a result of these sites.

The water quality parameters and water management strategies selected by the RHWPG were evaluated to determine the impacts on water quality as a result of these recommended strategies. This evaluation used the data available to compare current conditions to future conditions with Region H management strategies in place. The recommended management strategies, as described in Chapter 4 of this report and used in this evaluation, are:

- Conservation (Municipal, Industrial, and Irrigation)
- BRA System Operations
- New Contracts from Existing Supplies
- Contractual Transfers
- Freeport Desalination
- Brazos Saltwater Barrier
- Allens Creek Reservoir
- Houston to GCWA Transfer
- Lake Houston Additional Yield
- Wastewater Reuse – Houston
- Wastewater Reuse – NHCRWA
- Wastewater Reuse for Manufacturing
- TRA – Houston Contract

- Luce Bayou Interbasin Transfer
- Little River Off-Channel Reservoir

The following paragraphs discuss the impacts of each management strategy on the chosen water quality parameters.

Water Conservation, including municipal, industrial, and agricultural, can have both positive and negative impacts on water quality. Water that is being processed through a wastewater treatment plant typically has acquired additional dissolved solids prior to discharge to the waters of the state. Conventional wastewater treatment reduces suspended solids, but does not reduce dissolved solids in the effluent. Water conservation measures will reduce the volume of water passing through the wastewater plants without reducing the mass loading rates (a 1.6 gallon flush carries the same waste mass to the plant that a 6-gallon flush once carried). This may result in slightly increased conservative contaminant loads in the stream. However, it should be noted that during low flow conditions, the wastewater effluent in a stream may represent water that helps to augment and maintain the minimum stream flows. Tail water is the term used to describe that water returned to the stream after application to irrigated cropland. Tail water carries nutrients, sediments, salts, and other pollutants from the farmland. This return flow can have a negative impact on water quality, and by implementing conservation measures which reduce tail water losses, the nutrient and sediment loading can be reduced. Once again, however, this return flow tends to be introduced into the receiving stream during normally dry periods so it may have a net beneficial effect in terms of maintaining minimum stream flow conditions. Furthermore, the loss of the return flows could be offset by a reduction in irrigation diversions resulting in no net affect on the stream flow.

BRA System Operations strategy potentially impacts the water quality in the lower basin depending on the actual diversion quantities and diversion locations. The BRA will develop a management plan for implementing its System Operations Permit. The Management Plan will address actual operations under the system Operations Permit, including water quality considerations. Decreased instream flows directly influence saltwater intrusion, which may be mitigated by a Saltwater Barrier. However, in "Report in Support of System Operation Permit Application" prepared by Freese and Nichols, Inc. for the BRA, it is stated that system operations would not negatively impact instream flows and may increase the frequency of meeting instream criteria in many locations. Because many of the existing impaired segments within the Brazos Basin are located above system reservoirs, it was also found that there will be no significant impact on these segments.

Although the maximum diversions anticipated under the system operations conditions may pose some slight impact on estuary conditions, the frequency of occurrence for these actual diversions is very low. Additionally, since the Brazos River empties directly into the Gulf of Mexico, operational changes do not affect a bay system. Changes to flow patterns will likely be localized and fall within historical parameters. In conclusion, the BRA's analysis recognized the System Operations Permit to be more environmentally

sensitive than other potential strategies including new reservoir construction, groundwater resource development, and importing water supplies from outside the basin.

The Brazos Saltwater Barrier would help maintain water quality in the lower Brazos basin during low flow periods. Currently, during low flow periods the Dow Chemical and Brazosport Water Authority Lower intakes are compromised due to saltwater intrusion. Increased use of Brazos River supplies will extend this seasonal condition upstream unless a barrier or other control measure is implemented.

Freeport Desalination does not affect other water management strategies and effects only the salinity levels in the area of discharge. The discharge location for this strategy is to the Dow discharge canal, where it will blend with and be diluted by other treated process water before flowing into the Brazos River above the Intracoastal Waterway. The diversion of Brazos River water to supplement seawater supplies to the plant would maximize the operational efficiency, but could increase the salinity of the Brazos River Estuary, depending upon the size and season of the diversion.

Allens Creek Reservoir and Little River Off-Channel Reservoir potentially have positive impacts on water quality since they operate as "scalping reservoirs". During times of high flow, water quality in the Brazos River is poor in terms of suspended solids due to increased sediment loads. At the same time, that water is of better quality in terms of dissolved solids concentrations since the salt being introduced into the Brazos in its upper reaches is diluted. The water that is diverted and stored in reservoirs would allow sediments to settle out, so water released from the reservoir would potentially be of higher quality. In addition, water that is released from the reservoirs during low flow conditions would have a beneficial effect by diluting the low flow salt concentration in the river.

New Contracts from Existing Supplies, including the Houston to GCWA Transfer, Contractual Transfers and the TRA – Houston Contract are not expected to create any new water quality issues. Fully utilizing existing water supply projects may amplify some existing concerns, particularly contaminant concentrations due to reduced opportunities for in-stream dilution. The continued return of flows via wastewater treatment facility discharges will provide some mitigation of that effect. Typical municipal return flows are 60 percent of the total quantity diverted for use.

The Luce Bayou Interbasin Transfer will potentially improve the quality of Lake Houston, due to the blending with higher-quality water from the Trinity River. However, transfers such as this allow an increased opportunity for invasive species migration from the source to receiving waters. Additionally, the transfer will potentially reduce flow in the Trinity River below Dayton, because the Lake Livingston water rights are not fully utilized today. The affects of this reduced flow in the Trinity are mitigated by the existence of the Wallisville Saltwater Barrier at the mouth of the river, which maintains a minimum river level for navigation and prevents the migration of brackish water upstream.

Wastewater Reuse by Houston, by NHCRWA, and by Ship-Channel Industry will potentially reduce in-stream flows, thus concentrating any in-stream contaminants. However, the reuse process should remove a portion of the waste load discharged from these facilities, either through the secondary treatment process or simply by the rerouting of effluent. A concern for this strategy would be the disposal method for any liquid wastes from the secondary treatment. In the case of industrial reuse, the reverse-osmosis discharge water would be injected into the bottom of the Houston Ship Channel, into an already brackish zone. The Houston Ship Channel is dredged to a depth of 45-feet (five times the depth of Galveston Bay) with fresh water flowing to the bay at the top and salt water returning on the tides at the bottom. The reverse-osmosis discharge and resultant mixing would be in the salt water layer at the bottom of this channel. Additionally, this reuse is not projected to occur until a time when the overall water use of the region has increased. Wastewater return flows will increase proportionally, so that the reuse of this portion will not constitute a significant reduction below current return flows.

5.3 Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs

One of the distinguishing characteristics of Region H is the abundance of recreational opportunities that enrich the quality of life of its residents. (See Chapter 3 for a discussion of recreational water uses.) Recreation also contributes to attracting tourists and tourist dollars to the region. Some of these recreational activities are associated with water, both freshwater and salt water, and may be sensitive to water supply. The relation to water supply translates through impacts on reservoir levels, instream flows, bay and estuary inflows, water quality, habitat and aesthetics. Table 5-1 lists recreational activities in Region H and the ways in which those activities are sensitive to water supply.

Although the major reservoirs in Region H were built and are maintained for municipal and industrial water supply, their existence has spurred the development of recreation related economic activity around their perimeters. In addition, this recreation-oriented development expands the tax base of local jurisdictions located near the reservoirs. Other water bodies similarly provide economic opportunities in recreation support activities.

Table 5-1: Recreational Activities Associated with Water in Region H

Activity	Major Sensitivity to Supply
Boating (Canoe/kayak, sailboats, personal watercraft, power boats)	Reservoir level Instream flow Aesthetics
Swimming	Aesthetics Water quality Reservoir level Instream flow
Fishing	Reservoir level Instream flow Bay & Estuary inflows Water quality Habitat
Hunting	Habitat Instream flow
Parks (Camping, hiking, biking, horseback riding)	Aesthetics Habitat Instream flow
Nature Tourism	Reservoir level Instream flow Bay & Estuary inflows Habitat Aesthetics
Golfing	Course upkeep Aesthetics

These activities impact the economy of the region through many paths, some of which are captured under the heading of "commercial activities" in the municipal water user group (WUG) in the socioeconomic analysis of water shortages (discussed in Chapter 4). Examples of these would be the sale of boating equipment, pier use fees collected by a convenience store or hotel receipts. Others impacts are not accounted for among the WUGs.

The determination of a direct relationship between water management strategies and recreational opportunities and indirect economic impacts is not feasible, due to the numerous other factors that affect recreational economics (i.e., weather conditions, national economic conditions, travel restrictions, etc.). However, the collective affects of strategies on anticipated lake levels during historical meteorological conditions were analyzed and some conclusions may be inferred on the impacts to recreation and economics.

For this analysis, the TCEQ Water Availability Model was updated to include the water management strategies recommended by Region C and Region H in their 2001 Regional Water Plans. The tributaries to Galveston Bay were then modeled under four scenarios to compare the results with and without the recommended strategies. The scenarios used were Current Conditions (current levels of water diversions and return flows), Run 1 (full use of water rights with current percentage of return flows), Run 3 (full use of water

rights with no return flows) and a future condition (full use of water rights, new strategies in place, and full return flows except for recommended reuse strategies). The first three models used the Year 2000 reservoir sedimentation conditions, and the fourth used the 2060 condition. The future sedimentation condition benefits downstream projects, because upper basin projects have less capacity to store available flows. In this case, Lakes Houston and Livingston may be considered downstream projects.

The results of these simulations are summarized in Table 5-2. Reservoir elevations, capacities and surface areas are shown in Figure 5-1, Figure 5-2 and Figure 5-3 as a reference. Appendix 5B contains figures graphically displaying the model outputs and the percentile comparisons. Percentile values indicate the percentage of time the result value is less than or equal to the subject value. Therefore, the maximum value is the full lake elevation, the median value is the lake level in 50% of the monthly outputs, and the minimum value is the lowest monthly elevation in the simulation. Because the yield of these water supply reservoirs is based upon full use of the stored water during the drought of record, the Run 3 minimum elevation is, by definition, the lake bottom elevation. Note that this value is greater in the 2060 conditions simulation due to the projected accumulation of sediments on the reservoir floor. Each simulation run used the same 50-year inflow data set, which includes the drought of record period.

Table 5-2: Lake Level Percentile Tables

Lake Conroe Water Surface Elevations

	Current Conditions	Yr 2000 Run 1	Yr 2000 Run 3	Yr 2060 w/ Strategies
Maximum	201.0	201.0	201.0	201.0
90th	201.0	201.0	201.0	201.0
75th	201.0	200.7	200.6	200.6
Median	200.7	198.9	198.7	198.6
25th	199.3	194.7	193.9	194.2
10th	197.2	185.4	183.8	185.9
Minimum	191.9	145.0	145.0	152.0

Lake Houston Water Surface Elevations

	Current Conditions	Yr 2000 Run 1	Yr 2000 Run 3	Yr 2060 w/ Strategies
Maximum	44.0	44.0	44.0	44.0
90th	44.0	44.0	44.0	44.0
75th	44.0	44.0	44.0	44.0
Median	44.0	44.0	44.0	44.0
25th	43.6	43.6	43.0	44.0
10th	42.7	42.9	41.5	44.0
Minimum	36.2	37.0	28.5	40.4

Lake Livingston Water Surface Elevations

	Current Conditions	Yr 2000 Run 1	Yr 2000 Run 3	Yr 2060 w/ Strategies
Maximum	131.0	131.0	131.0	131.0
90th	131.0	131.0	131.0	131.0
75th	131.0	131.0	131.0	131.0
Median	131.0	131.0	129.7	131.0
25th	131.0	130.2	124.6	131.0
10th	130.9	127.9	117.8	130.0
Minimum	127.6	114.5	60.0	125.3

As can be seen from the table, under current conditions Lake Conroe would have a 9-ft elevation variation range during the historical period, Lake Houston an 8-ft range and Lake Livingston a 3-ft range. In all cases, the lakes are essentially full more than 50% of the time. To compare the runs with and without management strategies, it is best to compare Run 1 with the Recommended Strategies simulation, because both models use expected return flows.

Figure 5-1: Lake Conroe Surface Area and Capacity (2060 Conditions)

Surface Elevation	Surface Area	Storage Volume	Percent Fill
Feet (msl)	Acres	Acre-Feet	%
201	19,360	377,560	100%
195.5	15,600	283,170	75%
188.7	12,190	188,780	50%
179.5	8,500	94,390	25%
152			Bottom

Figure 5-2: Lake Houston Surface Area and Capacity (2060 Conditions)

Surface Elevation	Surface Area	Storage Volume	Percent Fill
Feet (msl)	Acres	Acre-Feet	%
44	11,850	106,410	100%
41.5	9,250	79,810	75%
38.0	7,780	53,210	50%
33.4	5,700	26,600	25%
20			Bottom

Figure 5-3: Lake Livingston Surface Area and Capacity (2060 Conditions)

Surface Elevation	Surface Area	Storage Volume	Percent Fill
Feet (msl)	Acres	Acre-Feet	%
131	82,920	1,717,080	100%
125.4	70,600	1,287,810	75%
118.6	56,920	858,540	50%
109.8	39,510	429,270	25%
63			Bottom

For Lake Conroe, full use of water rights reduces the frequency of the lake being full from 50% to 25% of the time in every simulation. The lake level falls below the current conditions minimum elevation between 10 and 25 percent of the time. The addition of the Bedias Reservoir and inter-basin transfer of that supply slightly increases the minimum value, but otherwise the results of the two models are about the same. One reason for this is discussed below.

For Lake Houston, the full use of water rights does not significantly change the lake level frequencies. This is mainly due to the fact that Lake Houston is senior in priority date to Lake Conroe, and therefore the model always stores available flows in Lake Houston first, and then makes the remainder available to Lake Conroe. In actual operation, a better balance is maintained between the two, but Lake Conroe will always decline faster than Lake Houston because it is supplied from a smaller watershed. Of note in the future condition simulation is that the import of water through Lake Houston via the Luce Bayou transfer increased the frequency of the lake being full from 50% to 90% of the time.

Finally, the Lake Livingston results show how dependent the reservoir is upon return flows from upstream (Run 3 condition). Under the recommended strategies run, the results are very close to the current conditions simulation. This is because increased use in the upper Trinity Basin is off-set by increased import of out-of-basin supplies. Region H indirectly benefits from the growth of the Dallas-Fort Worth Metroplex. In the current round of planning, Region C is increasing the amount of recommended reuse, although it is not expected they will reach the full-reuse condition modeled in Run 3.

The drought of record lasted six years, and subsequent droughts have exceeded two years in duration. Looking at the simulation results in Figures 5B-1 and 5B-5, it can be seen that when significant declines in lake levels occur, they will not be instantaneous events, but will be a subset of the overall drought period. Anecdotally, a month with low lake levels will impact a land owner's ability to use a dock. A year with low lake levels may impact his property rental or resale value. Similar inferences may be made as to the impacts on lake area communities and businesses.

Reduced lake levels will also impact water quality. During extreme low flow periods, reduced residence time in the reservoir will lessen the beneficial affects of sediment settling. Because the climate in this area is mild, the seasonal turn-over in lakes occurs less frequently than in colder climates. When reservoirs are drawn down, the denser lower layer of water will be tapped, which may increase the level of treatment required for use.

An option to mitigate these affects is to establish a minimum storage pool for a given reservoir, and prohibit withdrawals below that level. Because that would reduce the available storage pool for these reservoirs, and thus reduce the yield, such an imposition would constitute a taking of property. As a practical matter, the establishment of a minimum storage pool (for habitat, recreation, or other uses) would need to be off-set by the development of a new source of water supply, equal in yield to that lost from the lake.

Development of this additional supply would be costly, and was not considered under this plan.

5.4 Impacts of Moving Water from Rural and Agricultural Areas

Currently, the water used in rural (livestock) and agricultural areas represent 23% of the total water used in Region H. It is estimated that this will be reduced to 13% of the Region's 3,412,500 acre-feet demand projected in year 2060, mainly due to the growth of municipal and industrial demands. There is a slight projected decrease in irrigation (from 464,330 acre-feet per year in 2000 to 430,930 acre-feet per year in 2060, or a net reduction of 7%). Livestock demand is constant over the planning period. Water management strategies, along with current sources of water supply, are available to agricultural users throughout the planning period; therefore, the impacts on agricultural users are not directly related to moving water from these areas.

The potential impacts of moving water from rural and agricultural areas are mainly associated with socio-economic impacts to third parties. The potential impetus for moving water is expected to occur from two sources: 1) the cost of raw water may become too great for the local irrigator to afford, and he may elect to voluntarily leave the industry for economic reasons; or 2) the value of the raw water for municipal or industrial purposes may create a market for the wholesale owner to re-direct the sale of the water making it unavailable to the irrigator In some cases, it may be feasible for a third party to pay for conservation measures and then utilize the saved water for their own needs (through re-contracting or other agreements) and allow the irrigator to remain in business; however, there are few contractual and institutional measures in effect to allow this trade-off to occur at this time. The intent of this plan is to provide water or the conservation means to meet all projected water demands throughout the planning period.

Appendix 5A

Texas Commission on Environmental Quality 303(d)
List of Impaired Waters

DRAFT 2004 Texas 303(d) List

Explanation of Column Headings

SegID: May be one of two types of numbers. The first type is a classified segment number (4 digits, *e.g.* 0218), as defined in the *Texas Surface Water Quality Standards*. The second type is an unclassified water body (0218A), not defined in the Standards, associated with a classified water body because it is in the same watershed.

Area: This describes the specific area in which one or more water quality standards are not met.

Parameter: These are pollutants or water quality conditions that screening procedures indicate are the reason the water quality standards are not met.

Category: One of five categories is assigned to each combination of one parameter and one water body to provide information about the water quality status and management activities. Category 5 is divided into three subcategories; when a water body has parameters in multiple subcategories, its overall category is the highest category. The category and its subcategories are defined below:

Category 5: The water body does not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants.

Category 5a - A TMDL is underway, scheduled, or will be scheduled.

Category 5b - A review of the water quality standards for this water body will be conducted before a TMDL is scheduled.

Category 5c - Additional data and information will be collected before a TMDL is scheduled.

Rank: Water bodies in Category 5 have been prioritized by TCEQ. For Category 5a, a rank of High (H), Medium (M), or Low (L) is given to indicate the urgency to initiate a TMDL. Once a TMDL project is initiated, the rank changes to "U" for Underway. Rankings are based on the current understanding of the causes of the non-support of the water quality standards and the sources of pollution, the importance of the resource, the severity of the impact, and the likelihood of TMDL success.

For water bodies in Category 5b, a ranking of "S" has been assigned to indicate that a standards review will be conducted before a TMDL is scheduled. For water bodies in Category 5c, a ranking of "D" has been assigned to indicate that additional data and information will be collected before a TMDL is scheduled.

For Categories 5b and 5c, TCEQ will develop a separate prioritized schedule for standards review and the collection of additional data and information. These activities will be conducted at the same time that TMDLs are being developed for the parameters in Category 5a.

SegID: **0701** **Taylor Bayou Above Tidal** Category: **5c**

Water body location: From the saltwater lock 7.7 km (4.8 miles) downstream of SH 73 in Jefferson County to the Lower Neches Valley Authority Canal in Jefferson County

Area	Parameter	Category	Rank
Lower 8 miles of segment	depressed dissolved oxygen	5c	D
Portion 7 mi downstream of the confluence of N and S Forks	depressed dissolved oxygen	5c	D

SegID: **0701D** **Shallow Prong Lake (unclassified water body)** Category: **5c**

Water body location: Reservoir on Big Hill Bayou located approximately 3.5 miles downstream of the confluence with Taylor Bayou in Jefferson County

Area	Parameter	Category	Rank
Entire water body	depressed dissolved oxygen	5c	D

SegID: **0702A** **Alligator Bayou (unclassified water body)** Category: **5c**

Water body location: From the Alligator Bayou pump station at the Jefferson County hurricane protection levee one mile downstream of Spur 215 in Port Arthur to a point immediately upstream of the confluence with Jefferson county Drainage District No. 7 city outfall canal

Area	Parameter	Category	Rank
Drainage canal leading into Alligator Bayou approx. 0.8 miles north of SH82	acute toxicity in water to aquatic organisms	5c	D
Lower portion from SH82 to its confluence with Taylor Bayou	chronic toxicity in sediment to aquatic organisms	5c	D
Lower portion from SH82 to its confluence with Taylor Bayou	impaired fish community	5c	D
Upper portion from its headwaters at the Port Arthur Canal to SH82	acute toxicity in water to aquatic organisms	5c	D

SegID: **0704** **Hillebrandt Bayou** Category: **5c**

Water body location: From the confluence of Taylor Bayou in Jefferson County to a point 100 meters (110 yards) upstream of SH 124 in Jefferson County

Area	Parameter	Category	Rank
From confluence with Bayou Din to upper end of segment	depressed dissolved oxygen	5c	D
From confluence with Taylor Bayou to confluence with Bayou Din	depressed dissolved oxygen	5c	D

SegID: **0803** **Lake Livingston** Category: **5c**

Water body location: From Livingston Dam in Polk/San Jacinto County to a point 1.8 km (1.1 miles) upstream of Boggy Creek in Houston/Leon County, up to normal pool elevation of 131 feet (impounds Trinity River)

Area	Parameter	Category	Rank
Cove off upper portion of reservoir, East Trinity	depressed dissolved oxygen	5c	D
Cove off upper portion of reservoir, East Trinity	pH	5c	D
Lower portion of reservoir, East Willow Springs	depressed dissolved oxygen	5c	D
Lower portion of reservoir, East Wolf Creek	depressed dissolved oxygen	5c	D
Lowermost portion of reservoir, adjacent to dam	depressed dissolved oxygen	5c	D
Middle portion of reservoir, East Pointblank	depressed dissolved oxygen	5c	D
Upper portion of reservoir, west of Carlisle	high pH	5c	D

SegID: **0805** **Upper Trinity River** Category: **5a**

Water body location: From a point immediately upstream of the confluence of the Cedar Creek Reservoir discharge canal in Henderson/Navarro County to a point immediately upstream of the confluence of Elm Fork Trinity River in

Area	Parameter	Category	Rank
11 mile reach near S. Loop 12	PCBs in fish tissue	5a	H
11 mile reach near S. Loop 12	bacteria	5a	L
25 mile reach near SH 34	bacteria	5a	L

SegID: **0805** (continued) Category: **5a**

Area	Parameter	Category	Rank
Upper 8 miles	PCBs in fish tissue	5a	H
Upper 8 miles	bacteria	5a	L

SegID: **0806** **West Fork Trinity River Below Lake Worth** Category: **5a**

Water body location: From a point immediately upstream of the confluence of Village Creek in Tarrant County to Lake Worth Dam in Tarrant County

Area	Parameter	Category	Rank
Lower 22 miles of the segment	PCBs in fish tissue	5a	H
Lower 22 miles of the segment	bacteria	5a	L

SegID: **0807** **Lake Worth** Category: **5a**

Water body location: From Lake Worth Dam in Tarrant County to a point 4.0 km (2.5 miles) downstream of Eagle Mountain Dam in Tarrant County, up to normal pool elevation of 594.3 feet (impounds West Fork Trinity River)

Area	Parameter	Category	Rank
Entire reservoir	PCBs in fish tissue	5a	H

SegID: **0810** **West Fork Trinity River Below Bridgeport Reservoir** Category: **5c**

Water body location: From a point 0.6 km (0.4 miles) downstream of the confluence of Oates Branch in Wise County to Bridgeport Dam in Wise County

Area	Parameter	Category	Rank
Lower 25 miles of segment	bacteria	5c	D

SegID: **0812** **West Fork Trinity River Above Bridgeport Reservoir** Category: **5b**

Water body location: From a point immediately upstream of the confluence of Bear Hollow in Jack County to SH 79 in Archer County

Area	Parameter	Category	Rank
Lower 25 miles of segment	chloride	5b	S
Lower 25 miles of segment	depressed dissolved oxygen	5b	S
Lower 25 miles of segment	total dissolved solids	5b	S
Upper 60 miles of segment	chloride	5b	S
Upper 60 miles of segment	total dissolved solids	5b	S

SegID: **0814** **Chambers Creek Above Richland-Chambers Reservoir** Category: **5c**

Water body location: From a point 4.0 km (2.5 miles) downstream of Tupelo Branch in Navarro County to the confluence of North Fork Chambers Creek and South Fork Chambers Creek

Area	Parameter	Category	Rank
From confluence with Cummins Creek to a point 16.5 miles upstream	depressed dissolved oxygen	5c	D

SegID: **0818** **Cedar Creek Reservoir** Category: **5c**

Water body location: From Joe B. Hoggsett Dam in Henderson County up to normal pool elevation of 322 feet (impounds Cedar Creek)

Area	Parameter	Category	Rank
Caney Creek cove	high pH	5c	D
Clear Creek cove	high pH	5c	D
Cove off lower portion of reservoir adjacent to Clearview	high pH	5c	D
Lower portion of reservoir east of Key Ranch Estates	high pH	5c	D
Lowermost portion of reservoir adjacent to dam	high pH	5c	D
Middle portion of reservoir downstream of Twin Creeks cove	high pH	5c	D
Twin Creeks cove	high pH	5c	D
Upper portion of reservoir adjacent to Lacy Fork cove	high pH	5c	D
Upper portion of reservoir east of Tolosa	high pH	5c	D
Uppermost portion of reservoir downstream of Kings Creek	high pH	5c	D

SegID: **0820C** **Muddy Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with Lake Ray Hubbard, in Dallas County, to the headwaters east of Allen, in Collin

Area	Parameter	Category	Rank
Entire creek	bacteria	5c	D

SegID: **0823A** **Little Elm Creek (unclassified water body)** Category: **5c**

Water body location: Perennial stream from FM 455 in Collin County up to 1.4 km above FM 121 in Grayson County near Gunter

Area	Parameter	Category	Rank
Entire creek	bacteria	5c	D

SegID: **0824** **Elm Fork Trinity River Above Ray Roberts Lake** Category: **5c**

Water body location: From a point 9.5 km (5.9 miles) downstream of the confluence of Pecan Creek in Cooke County to US 82 in Montague County

Area	Parameter	Category	Rank
3.5 mile reach near SH 51	bacteria	5c	D
Lower 7.5 miles of segment	bacteria	5c	D

SegID: **0829** **Clear Fork Trinity River Below Benbrook Lake** Category: **5a**

Water body location: From the confluence with the West Fork Trinity River in Tarrant County to Benbrook Dam in Tarrant

Area	Parameter	Category	Rank
Lower mile of segment	PCBs in fish tissue	5a	H

SegID: **0831** **Clear Fork Trinity River Below Lake Weatherford** Category: **5b**

Water body location: From a point 200 meters (220 yards) downstream of US 377 in Tarrant County to Weatherford Dam in

Area	Parameter	Category	Rank
2 mi upstream of South Fork Trinity R. confluence to Squaw Ck confluence	bacteria	5c	D
2 mi upstream of South Fork Trinity R. confluence to Squaw	depressed dissolved oxygen	5b	S
From the confluence of Squaw Ck. to Lake Weatherford Dam	depressed dissolved oxygen	5b	S

SegID: **0833** **Clear Fork Trinity River Above Lake Weatherford** Category: **5b**

Water body location: From a point 3.1 km (1.9 miles) upstream of FM 1707 in Parker County, to FM 3107 in Parker County

Area	Parameter	Category	Rank
From the confluence of McKnight Branch to the confluence of Cottonwood Ck.	depressed dissolved oxygen	5b	S
Upper 11 miles of segment	depressed dissolved oxygen	5b	S

SegID: **0836** **Richland-Chambers Reservoir** Category: **5c**

Water body location: From Richland-Chambers Dam in Freestone County to the confluence of Pin Oak Creek on the Richland Creek Arm in Navarro County and to a point 4.0 km (2.5 miles) downstream of Tupelo Branch on the Chambers Creek Arm in Navarro County, up to normal pool elevation of 315 feet (impounds Richland and Chambers Creeks)

Area	Parameter	Category	Rank
Lower portion of Chambers Creek arm	high pH	5c	D

SegID: **0841** **Lower West Fork Trinity River** Category: **5a**

Water body location: From a point immediately upstream of the confluence of the Elm Fork Trinity River in Dallas County to a point immediately upstream of the confluence of Village Creek in Tarrant County

Area	Parameter	Category	Rank
Lower 14 miles of segment	PCBs in fish tissue	5a	H
Lower 14 miles of segment	bacteria	5a	L
Upper 13 miles of segment	PCBs in fish tissue	5a	H

SegID: **0901** **Cedar Bayou Tidal** Category: **5a**

Water body location: From the confluence with Galveston Bay 1.0 km (0.6 miles) downstream of Tri-City Beach Road in Chambers County to a point 2.2 km (1.4 miles) upstream of IH 10 in Chambers/Harris County

Area	Parameter	Category	Rank
Entire segment	dioxin in catfish and crab tissue	5a	U

SegID: **0902** **Cedar Bayou Above Tidal** Category: **5c**

Water body location: From a point 2.2 km (1.4 miles) upstream of IH 10 in Chambers/Harris County to a point 7.4 km (4.6 miles) upstream of FM 1960 in Liberty County

Area	Parameter	Category	Rank
Entire segment	depressed dissolved oxygen	5c	D

SegID: **1001** **San Jacinto River Tidal** Category: **5a**

Water body location: From a point 100 meters (110yards) downstream of IH 10 in Harris County to Lake Houston Dam in Harris County

Area	Parameter	Category	Rank
From Lake Houston Dam to US Hwy 90	dioxin in catfish and crab tissue	5a	U
From US Hwy 90 to downstream of IH 10	PCBs in fish tissue	5a	H
From US Hwy 90 to downstream of IH 10	dioxin in catfish and crab tissue	5a	U

SegID: **1004** **West Fork San Jacinto River** Category: **5c**

Water body location: From the confluence of Spring Creek in Harris/Montgomery County to Conroe Dam in Montgomery County

Area	Parameter	Category	Rank
IH 45 to a point 10 miles downstream	bacteria	5c	D

SegID: **1005** **Houston Ship Channel/San Jacinto River Tidal** Category: **5a**

Water body location: From the confluence with Galveston Bay at Morgan's Point in Harris/Chambers County to a point 100 meters (110 yards) downstream of IH 10 in Harris County

Area	Parameter	Category	Rank
Downstream I-10 to Lynchburg Ferry Road	PCBs in fish tissue	5a	H
Downstream I-10 to Lynchburg Ferry Road	dioxin in catfish and crab tissue	5a	U
Goose Island to SH 146	dioxin in catfish and crab tissue	5a	U
Lynchburg Ferry Road to Goose Island	dioxin in catfish and crab tissue	5a	U
SH 146 to Morgans Point	dioxin in catfish and crab tissue	5a	U

SegID: **1006** **Houston Ship Channel Tidal** Category: **5a**

Water body location: From the confluence with the San Jacinto River in Harris County to a point immediately upstream of Greens Bayou in Harris County, including tidal portions of tributaries

Area	Parameter	Category	Rank
Goodyear Creek Tidal	PCBs in fish tissue	5a	H
Goodyear Creek Tidal	chlordane in fish tissue	5a	H
Goodyear Creek Tidal	dieldrin in fish tissue	5a	H
Goodyear Creek Tidal	dioxin in catfish and crab tissue	5a	U
Goodyear Creek Tidal	heptachlor epoxide in fish tissue	5a	H
Greens Bayou Tidal	PCBs in fish tissue	5a	H
Greens Bayou Tidal	chlordane in fish tissue	5a	H
Greens Bayou Tidal	dieldrin in fish tissue	5a	H
Greens Bayou Tidal	dioxin in catfish and crab tissue	5a	U
Greens Bayou Tidal	heptachlor epoxide in fish tissue	5a	H
Houston Ship Channel Tidal	PCBs in fish tissue	5a	H
Houston Ship Channel Tidal	chlordane in fish tissue	5a	H
Houston Ship Channel Tidal	dieldrin in fish tissue	5a	H
Houston Ship Channel Tidal	dioxin in catfish and crab tissue	5a	U
Houston Ship Channel Tidal	heptachlor epoxide in fish tissue	5a	H
Patrick Bayou Tidal	PCBs in fish tissue	5a	H
Patrick Bayou Tidal	acute toxicity in sediment to aquatic organisms	5c	D
Patrick Bayou Tidal	chlordane in fish tissue	5a	H
Patrick Bayou Tidal	dieldrin in fish tissue	5a	H
Patrick Bayou Tidal	dioxin in catfish and crab tissue	5a	U
Patrick Bayou Tidal	heptachlor epoxide in fish tissue	5a	H
Patrick Bayou Tidal	mercury in water	5c	D
Patrick Bayou Tidal	temperature	5c	D

SegID: **1006D** **Halls Bayou Below US 59 (unclassified water body)** Category: **5a**

Water body location: Perennial stream from the confluence with Greens Bayou up to US 59 in Harris County

Area	Parameter	Category	Rank
From US 59 to Hirsch Road	bacteria	5a	M
Tidwell Road to confluence with Greens Bayou	bacteria	5a	M

SegID: **1006E** **Halls Bayou Above US 59 (unclassified water body)** Category: **5a**

Water body location: Perennial stream from US 59 upstream to Frick Road

Area	Parameter	Category	Rank
Entire stream reach	bacteria	5a	M

SegID: **1006F** **Big Gulch Above Tidal (unclassified water body)** Category: **5a**

Water body location: From the confluence with Greens Bayou Tidal to Wallisville Road in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1006H** **Spring Gully Above Tidal (unclassified water body)** Category: **5a**

Water body location: From confluence with Greens Bayou to US 90 in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1006I** **Unnamed Tributary of Halls Bayou (unclassified water body)** Category: **5a**

Water body location: From the confluence with Halls Bayou to a point 0.13 miles upstream of Richland Drive in Harris County

Area	Parameter	Category	Rank
Entire segment	bacteria	5a	M

SegID: **1006J** **Unnamed Tributary of Halls Bayou (unclassified water body)** Category: **5a**

Water body location: From the confluence of Halls Bayou (east of US 59 and south of Langley Road) to Mount Houston Road in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1007** **Houston Ship Channel/Buffalo Bayou Tidal** Category: **5a**

Water body location: From a point immediately upstream of Greens Bayou in Harris County to a point 100 meters (110 yards) upstream of US 59 in Harris County, including tidal portion of tributaries

Area	Parameter	Category	Rank
Berry Bayou Tidal	PCBs in fish tissue	5a	H
Berry Bayou Tidal	chlordane in fish tissue	5a	H
Berry Bayou Tidal	dieldrin in fish tissue	5a	H
Berry Bayou Tidal	dioxin in catfish and crab tissue	5a	U
Berry Bayou Tidal	heptachlor epoxide in fish tissue	5a	H
Brays Bayou Tidal	PCBs in fish tissue	5a	H
Brays Bayou Tidal	chlordane in fish tissue	5a	H
Brays Bayou Tidal	dieldrin in fish tissue	5a	H
Brays Bayou Tidal	dioxin in catfish and crab tissue	5a	U
Brays Bayou Tidal	heptachlor epoxide in fish tissue	5a	H
Houston Ship Channel/Buffalo Bayou Tidal	PCBs in fish tissue	5a	H
Houston Ship Channel/Buffalo Bayou Tidal	chlordane in fish tissue	5a	H
Houston Ship Channel/Buffalo Bayou Tidal	dieldrin in fish tissue	5a	H
Houston Ship Channel/Buffalo Bayou Tidal	dioxin in catfish and crab tissue	5a	U
Houston Ship Channel/Buffalo Bayou Tidal	heptachlor epoxide in fish tissue	5a	H
Hunting Bayou Tidal	PCBs in fish tissue	5a	H
Hunting Bayou Tidal	chlordane in fish tissue	5a	H
Hunting Bayou Tidal	dieldrin in fish tissue	5a	H
Hunting Bayou Tidal	dioxin in catfish and crab tissue	5a	U
Hunting Bayou Tidal	heptachlor epoxide in fish tissue	5a	H
Sims Bayou Tidal	PCBs in fish tissue	5a	H
Sims Bayou Tidal	chlordane in fish tissue	5a	H
Sims Bayou Tidal	dieldrin in fish tissue	5a	H
Sims Bayou Tidal	dioxin in catfish and crab tissue	5a	U
Sims Bayou Tidal	heptachlor epoxide in fish tissue	5a	H
Vince Bayou Tidal	PCBs in fish tissue	5a	H
Vince Bayou Tidal	acute toxicity in sediment to aquatic organisms	5c	D
Vince Bayou Tidal	chlordane in fish tissue	5a	H
Vince Bayou Tidal	dieldrin in fish tissue	5a	H
Vince Bayou Tidal	dioxin in catfish and crab tissue	5a	U
Vince Bayou Tidal	heptachlor epoxide in fish tissue	5a	H

SegID: **1007B** **Brays Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: Perennial stream from 11.5 km upstream of confluence with Houston Ship Channel up to SH 6

Area	Parameter	Category	Rank
From 11.5km upstream of confluence with Houston Ship Channel (Brays Bayou Tidal) to SH 6	bacteria	5a	M

SegID: **1007C** **Keegans Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: Perennial stream from confluence with Brays Bayou upstream to Harris County line

Area	Parameter	Category	Rank
From Harris County line to confluence with Brays Bayou	bacteria	5a	M

SegID: **1007D** **Sims Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: Perennial stream from 11.0 km upstream of confluence with Houston Ship Channel upstream to Hiram Clark

Area	Parameter	Category	Rank
From 11.0km upstream of confluence with Houston Ship Channel (Sims Bayou Tidal) to Hiram Clarke	bacteria	5a	M

SegID: **1007E** **Willow Waterhole Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: Perennial stream from confluence with Brays Bayou upstream to South Garden (in Missouri City)

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1007F** **Berry Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: Perennial stream from 2.4 km upstream from the confluence with Sims Bayou to the southern city limits of South Houston

Area	Parameter	Category	Rank
1.5 miles upstream from confluence with Sims Bayou to SH 3	bacteria	5a	M

SegID: **1007G** **Kuhlman Gully Above Tidal (unclassified water body)** Category: **5a**

Water body location: From confluence with Brays Bayou in Harris County to Atchison, Topeka and Santa Fe Railroad tracks in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1007H** **Pine Gully Above Tidal (unclassified water body)** Category: **5a**

Water body location: From the confluence with Sims Bayou in Harris County to Broadway in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M
Entire stream	depressed dissolved oxygen	5c	D

SegID: **1007I** **Plum Creek Above Tidal (unclassified water body)** Category: **5a**

Water body location: From the confluence with Sims Bayou in Harris County to Telephone Road in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M
Entire stream	depressed dissolved oxygen	5c	D

SegID: **1007K** **Country Club Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: From the confluence with Brays Bayou to approximately 0.5 miles upstream of North Wayside Drive in Harris County

Area	Parameter	Category	Rank
Entire segment	bacteria	5a	M
Entire segment	depressed dissolved oxygen	5c	D

SegID: **1007L** **Unnamed Non-Tidal Tributary of Brays Bayou (unclassified water body)** Category: **5a**

Water body location: From the confluence with Brays Bayou near Fondren Road to a point 0.60 miles upstream in Harris County

Area	Parameter	Category	Rank
Entire perennial portion of stream	bacteria	5a	M

SegID: **1007M** **Unnamed Non-Tidal Tributary of Hunting Bayou (unclassified water body)** Category: **5a**

Water body location: From the confluence with Hunting Bayou to Mercury Road in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1007N** **Unnamed Non-Tidal Tributary of Sims Bayou (unclassified water body)** Category: **5a**

Water body location: From confluence with Sims Bayou, south of Airport Road, to Reed Road, east of SH 288 in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1007O** **Unnamed Non-Tidal Tributary of Buffalo Bayou (unclassified water body)** Category: **5a**

Water body location: From confluence with Buffalo Bayou to IH-10 between Hirsch Road and Lockwood in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M
Entire stream	depressed dissolved oxygen	5c	D

SegID: **1007P** **Brays Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: From Alief Clodine Road to SH 6 in Harris County

Area	Parameter	Category	Rank
From Alief Clodine Road to SH 6	bacteria	5a	M

SegID: **1007Q** **Sims Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: From Hiram Clark Drive to south of West Orem Road in Harris County

Area	Parameter	Category	Rank
From South Post Oak to Tiffany Drive	bacteria	5a	M
From Tiffany Drive to Hiram Creek	bacteria	5a	M
From just south of West Orem Road to South Post Oak	bacteria	5a	M
From just south of West Orem Road to South Post Oak	depressed dissolved oxygen	5c	D

SegID: **1007R** **Hunting Bayou Above Tidal (unclassified water body)** Category: **5a**

Water body location: From the confluence with Hunting Bayou Tidal at IH-10 to Maury Street on the north fork and Bain Street on the south fork

Area	Parameter	Category	Rank
From Bains Street to Sayers Street (South Fork)	bacteria	5a	M
From Bains Street to Sayers Street (South Fork)	depressed dissolved oxygen	5c	D
From Falls Street to Loop 610 (South of US 90A)	bacteria	5a	M
From Loop 610 to IH 10	bacteria	5a	M

SegID: **1008** **Spring Creek** Category: **5b**

Water body location: From the confluence with the West Fork San Jacinto River in Harris/Montgomery County to the most upstream crossing of FM 1736 in Waller County

Area	Parameter	Category	Rank
Field Store Road to SH 249	depressed dissolved oxygen	5b	S
IH 45 to confluence with Lake Houston	bacteria	5c	D

SegID: **1009** **Cypress Creek** Category: **5c**

Water body location: From the confluence with Spring Creek in Harris County to the confluence of Snake Creek and Mound Creek in Waller County

Area	Parameter	Category	Rank
IH 45 to confluence with Spring Creek	bacteria	5c	D
SH 249 to IH 45	bacteria	5c	D
US 290 to SH 249	bacteria	5c	D
Upper portion of segment to downstream of US 290	bacteria	5c	D

SegID: **1013** **Buffalo Bayou Tidal** Category: **5a**

Water body location: From a point 100 meters (110 yards) upstream of US 59 in Harris County to a point 400 meters (440 yards) upstream of Shepard Drive in Harris County

Area	Parameter	Category	Rank
Entire segment	bacteria	5a	U

SegID: **1013A** **Little White Oak Bayou (unclassified water body)** Category: **5a**

Water body location: Perennial stream from the confluence with Whiteoak Bayou up to RR tracks north of IH 610

Area	Parameter	Category	Rank
From RR tracks north of IH 610 to Trimble St	bacteria	5a	M
From RR tracks north of IH 610 to Trimble St	depressed dissolved oxygen	5c	D
From Trimble St to confluence with White Oak Bayou	bacteria	5a	M

SegID: **1013C** **Unnamed Non-Tidal Tributary of Buffalo Bayou Tidal (unclassified water body)** Category: **5a**

Water body location: Located approximately 1.8 miles upstream of the Buffalo Bayou/White Oak Bayou confluence between IH-10 and Memorial Drive west of IH-45 in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1014** **Buffalo Bayou Above Tidal** Category: **5a**

Water body location: From a point 400 meters (440 yards) upstream of Shepherd Drive in Harris County to SH 6 in Harris County

Area	Parameter	Category	Rank
Entire segment	bacteria	5a	U

SegID: **1014H** **South Mayde Creek (unclassified water body)** Category: **5a**

Water body location: Perennial stream in the Addicks Reservoir flood pool area, from the confluence with Buffalo Bayou upstream to the confluence with an unnamed tributary 0.62 km east of Barker-Cypress Road

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1014K** **Turkey Creek (unclassified water body)** Category: **5a**

Water body location: Perennial stream from the confluence with South Mayde Creek in Harris County upstream to the headwaters south of Clay Road in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1014M** **Neimans Bayou (unclassified water body)** Category: **5a**

Water body location: From confluence with Buffalo Bayou Above Tidal to upstream of IH 10

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M
Entire stream	depressed dissolved oxygen	5c	D

SegID: **1014N** **Rummel Creek (unclassified water body)** Category: **5a**

Water body location: From confluence with Buffalo Bayou Above Tidal in Harris County to IH 10/Beltway 8 in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1014O** **Spring Branch (unclassified water body)** Category: **5a**

Water body location: From confluence with Buffalo Bayou in Harris County to Blalock Road in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1016** **Greens Bayou Above Tidal** Category: **5a**

Water body location: From a point 0.7 km (0.4 miles) above the confluence of Halls Bayou in Harris County to a point 100 meters (110 yards) above FM 1960 in Harris County

Area	Parameter	Category	Rank
IH 45 to US 59	bacteria	5a	L
Upstream FM 1960 to IH 45	bacteria	5a	L

SegID: **1016A** **Garners Bayou (unclassified water body)** Category: **5a**

Water body location: Perennial stream from the confluence with Williams Gully upstream to 1.5 km north of Atoscocita Road

Area	Parameter	Category	Rank
From Williams Gully confluence to confluence with Greens Bayou	bacteria	5a	M
From a point adjacent to Vegas Road to Williams Gully confluence	bacteria	5a	M

SegID: **1016B** **Unnamed Tributary of Greens Bayou (unclassified water body)** Category: **5a**

Water body location: From confluence with Greens Bayou to Hirsch Road in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1016C** **Unnamed Tributary of Greens Bayou (unclassified water body)** Category: **5a**

Water body location: From the confluence with Greens Bayou, east of Aldine Westfield Road, to the Hardy Toll Road in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1016D** **Unnamed Tributary of Greens Bayou (unclassified water body)** Category: **5a**

Water body location: From confluence with Greens Bayou, west of El Dorado Country Club to Lee Road, west of US Hwy 59 in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M
Entire stream	depressed dissolved oxygen	5c	D

SegID: **1017** **Whiteoak Bayou Above Tidal** Category: **5a**

Water body location: From a point immediately upstream of the confluence of Little White Oak Bayou in Harris County to a point

Area	Parameter	Category	Rank
Entire segment	bacteria	5a	U

SegID: **1017A** **Brickhouse Gully/Bayou (unclassified water body)** Category: **5a**

Water body location: Perennial stream from the confluence with Whiteoak Bayou up to Gessner Road

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1017B** **Cole Creek (unclassified water body)** Category: **5a**

Water body location: Perennial stream from the confluence with White Oak Bayou up to south of Beltway 8

Area	Parameter	Category	Rank
From Flintlock Street to confluence with White Oak Bayou	bacteria	5a	M

SegID: **1017D** **Unnamed Tributary of White Oak Bayou (unclassified water body)** Category: **5a**

Water body location: From confluence with White Oak Bayou downstream of TC Jester, to Hempstead Hwy, north of US Hwy 290 in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M
Entire stream	depressed dissolved oxygen	5c	D

SegID: **1017E** **Unnamed Tributary of White Oak Bayou (unclassified water body)** Category: **5a**

Water body location: From the confluence with White Oak Bayou, near W 11th Street, to just upstream of W 26th Street, south of Loop 610 W in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1101** **Clear Creek Tidal** Category: **5a**

Water body location: From the confluence with Clear Lake at a point 3.2 km (2.0 miles) downstream of El Camino Real in Galveston/Harris County to a point 100 m (110 yards) upstream of FM528 in Galveston/Harris County

Area	Parameter	Category	Rank
Downstream of SH 3 to confluence with Clear Lake	bacteria	5a	M
IH 45 to SH 3	bacteria	5a	M
Upstream of FM 528 to IH 45	bacteria	5a	M

SegID: **1101B** **Chigger Creek (unclassified water body)** Category: **5a**

Water body location: From the confluence of Clear Creek Tidal to the Brazos River Authority Canal near CR 143 in Galveston County

Area	Parameter	Category	Rank
FM 528 to the confluence with Clear Creek	bacteria	5a	M
From the headwaters to FM 528	bacteria	5a	M

SegID: **1102** **Clear Creek Above Tidal** Category: **5a**

Water body location: From a point 100 meters (110 yards) upstream of FM 528 in Galveston/Harris County to Rouen Road in Fort Bend County

Area	Parameter	Category	Rank
FM 1959 to upstream of FM 528	bacteria	5a	M
FM 1959 to upstream of FM 528	chloride	5a	U
FM 1959 to upstream of FM 528	total dissolved solids	5a	U
SH 35 to FM 1959 (Dixie Farm Road)	bacteria	5a	M
SH 35 to FM 1959 (Dixie Farm Road)	chloride	5a	U
SH 35 to FM 1959 (Dixie Farm Road)	total dissolved solids	5a	U
Upper segment boundary to SH 35	bacteria	5a	M
Upper segment boundary to SH 35	chloride	5a	U
Upper segment boundary to SH 35	total dissolved solids	5a	U

SegID: **1102A** **Cowart Creek (unclassified water body)** Category: **5a**

Water body location: Intermittent stream with perennial pools from the confluence with Clear Creek in Galveston County to SH 35 in Brazoria County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1102B** **Mary's Creek/ North Fork Mary's Creek (unclassified water body)** Category: **5a**

Water body location: Perennial stream from the confluence with Clear Creek upstream to the confluence with North Fork Mary's Creek and South Fork Mary's Creek near FM 1128, approximately 5 km southwest of Pearland. Includes perennial portions of North Fork Mary's Creek from the confluence to Mary's Creek to the confluence of an unnamed tributary approximately 3.2 km upstream of FM 1128

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1103** **Dickinson Bayou Tidal** Category: **5a**

Water body location: From the confluence with Dickinson Bay 2.1 km (1.3 miles) downstream of SH 146 in Galveston County to a point 4.0 km (2.5 miles) downstream of FM 517 in Galveston County

Area	Parameter	Category	Rank
Arcadia Cemetery Road to IH 45	bacteria	5a	M
Arcadia Cemetery Road to IH 45	depressed dissolved oxygen	5a	U
Benson Bayou confluence to SH 3	bacteria	5a	M
Benson Bayou confluence to SH 3	depressed dissolved oxygen	5a	U
IH 45 to Benson Bayou confluence	bacteria	5a	M
IH 45 to Benson Bayou confluence	depressed dissolved oxygen	5a	U
Upper segment boundary to Arcadia Cemetery Road	bacteria	5a	M
Upper segment boundary to Arcadia Cemetery Road	depressed dissolved oxygen	5a	U

SegID: **1103A** **Bensons Bayou (unclassified water body)** Category: **5c**

Water body location: From the confluence with Dickinson Bayou Tidal to 0.37 miles upstream of FM 646 in Galveston County

Area	Parameter	Category	Rank
Entire stream	bacteria	5c	D

SegID: **1103B** **Bordens Gully (unclassified water body)** Category: **5a**

Water body location: From confluence with Dickinson Bayou Tidal to upstream of Calder Road in Galveston County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1103C** **Geisler Bayou (unclassified water body)** Category: **5a**

Water body location: From confluence with Dickinson Bayou tidal to IH 45 in Galveston County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1103D** **Gum Bayou (unclassified water body)** Category: **5a**

Water body location: From confluence with Dickinson Bayou to FM 3436 in Galveston County

Area	Parameter	Category	Rank
Entire stream	bacteria	5a	M

SegID: **1104** **Dickinson Bayou Above Tidal** Category: **5a**

Water body location: From a point 4.0 km (2.5 miles) downstream of FM 517 in Galveston County to FM 528 in Galveston County

Area	Parameter	Category	Rank
Entire segment	bacteria	5a	M

SegID: **1110** **Oyster Creek Above Tidal** Category: **5b**

Water body location: From a point 100 meters (110 yards) upstream of FM 2004 in Brazoria County to the Brazos River Authority diversion dam 1.8 km (1.1 miles) upstream of SH 6 in Fort Bend County

Area	Parameter	Category	Rank
From just upstream of Ramsey Prison Unit (Cow Cr) to CR 290/S Walker St.	depressed dissolved oxygen	5b	S

SegID: **1113** **Armand Bayou Tidal** Category: **5b**

Water body location: From the confluence with Clear Lake (at NASA Road 1 bridge) in Harris County to a point 0.8 km (0.5 miles) downstream of Genoa-Red Bluff road in Pasadena in Harris County (includes Mud Lake)

Area	Parameter	Category	Rank
Upper segment boundary to Bay Area Blvd.	depressed dissolved oxygen	5b	S

SegID: **1113A** **Armand Bayou Above Tidal (unclassified water body)** Category: **5b**

Water body location: From a point 0.8 km (0.5 miles) downstream of Genoa-Red Bluff Road in Pasadena in Harris County

Area	Parameter	Category	Rank
Entire stream	bacteria	5c	D
Entire stream	depressed dissolved oxygen	5b	S

SegID: **1202H** **Allen's Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the Brazos River, two miles northeast of Wallis, to the headwaters one mile north of IH 10 in Austin County.

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1202J** **Big Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence of Cottonwood and Kunz Creeks, 5 miles north of Needville in Fort Bend County, downstream to the confluence with the Brazos River

Area	Parameter	Category	Rank
Upstream portion of water body to Whaley-Longpoint Road	bacteria	5c	D

SegID: **1209** **Navasota River Below Lake Limestone** Category: **5c**

Water body location: From the confluence with the Brazos River in Grimes County to Sterling C. Robertson Dam in Leon/Robertson County

Area	Parameter	Category	Rank
From confluence with Camp Creek to 25 miles upstream	bacteria	5c	D
From confluence with Rocky Creek to confluence with Sandy Branch	bacteria	5c	D
From lower segment boundary to confluence with Rocky	bacteria	5c	D

SegID: **1209A** **Country Club Lake (unclassified water body)** Category: **5c**

Water body location: From the Country Club Branch Dam up to normal pool elevation in Bryan in Brazos County

Area	Parameter	Category	Rank
Entire reservoir	chronic toxicity in sediment to aquatic organisms	5c	D

SegID: **1209B** **Fin Feather Lake (unclassified water body)** Category: **5c**

Water body location: From Fin Feather Dam up to normal pool elevation in northwest Bryan in Brazos County

Area	Parameter	Category	Rank
Entire lake	chronic toxicity in sediment to aquatic organisms	5c	D

SegID: **1209C** **Carters Creek (unclassified water body)** Category: **5c**

Water body location: Perennial stream from the confluence with the Navasota River southeast of College Station in Brazos County upstream to the confluence of an unnamed tributary 0.5 km upstream of FM 158 in Brazos County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1209G** **Cedar Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the Navasota River in Brazos County to the confluence with Moores Branch and Rocky Branch in Robertson County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1209I** **Gibbons Creek (unclassified water body)** Category: **5c**

Water body location: From confluence with Navasota River in Grimes County to SH 90 in Grimes County

Area	Parameter	Category	Rank
From confluence with Dry Creek to SH 90	depressed dissolved oxygen	5c	D
From lower end to confluence with Dry Creek	bacteria	5c	D

SegID: **1209J** **Shepherd Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the Navasota River in Madison County to a point 0.7 miles upstream of FM 1452 in Madison County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1209K** **Steele Creek (unclassified water body)** Category: **5c**

Water body location: From confluence with Navasota River in Robertson County to a point 2.4 miles upstream of FM 147 in Limestone County

Area	Parameter	Category	Rank
Lower 25 miles	bacteria	5c	D

SegID: **1210** **Lake Mexia** Category: **5b**

Water body location: From Bistone Dam in Limestone County up to the normal pool elevation of 448.3 feet (impounds Navasota River)

Area	Parameter	Category	Rank
Eastern end of reservoir, from dam to RR 2681 east of Washington Park	depressed dissolved oxygen	5b	S

SegID: **1210** (continued) Category: **5b**

Area	Parameter	Category	Rank
Western end, from point where reservoir begins to widen, to upper end	depressed dissolved oxygen	5b	S

SegID: **1210A** **Navasota River above Lake Mexia (unclassified water body)** Category: **5c**

Water body location: From the confluence with the headwaters of Lake Mexia in Limestone County to a point 1.25 miles upstream of SH 31 in Hill County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1211A** **Davidson Creek (unclassified water body)** Category: **5c**

Water body location: Intermittent stream with perennial pools from the confluence with Yegua Creek to 0.2 km above SH 21 near Caldwell in Burleson County

Area	Parameter	Category	Rank
Upper 25 miles	bacteria	5c	D

SegID: **1212** **Somerville Lake** Category: **5c**

Water body location: From Somerville Dam in Burleson/Washington County up to normal pool elevation of 238 feet (impounds Yegua Creek)

Area	Parameter	Category	Rank
Eastern end of reservoir near dam	low and high pH	5c	D

SegID: **1212B** **East Yegua Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with Middle Yegua and Yegua Creeks southeast of Dime Box in Lee County to the upstream portion of the stream, south of Alcoa Lake in Milam County

Area	Parameter	Category	Rank
Lower 25 miles	bacteria	5c	D

SegID: **1217** **Lampasas River Above Stillhouse Hollow Lake** Category: **5c**

Water body location: From a point immediately upstream of the confluence of Rock Creek in Bell County to FM 2005 in Hamilton County

Area	Parameter	Category	Rank
From the FM 1690 crossing to the CR 117 crossing	bacteria	5c	D

SegID: **1217A** **Rocky Creek (unclassified water body)** Category: **5b**

Water body location: From the confluence of the Lampasas River north of Okalla in Burnet County to the confluences of the North and South Rocky Creeks south of Oakalla in Burnet County

Area	Parameter	Category	Rank
Entire creek	depressed dissolved oxygen	5b	S

SegID: **1218** **Nolan Creek/ South Nolan Creek** Category: **5c**

Water body location: From the confluence with the Leon River in Bell County to a point 100 meters (110 yards) upstream to the most upstream crossing of US 190 and Loop 172 in Bell County

Area	Parameter	Category	Rank
Entire segment	bacteria	5c	D

SegID: **1221** **Leon River Below Proctor Lake** Category: **5c**

Water body location: From a point 100 meters (110 yards) upstream of FM 236 in Coryell County to Proctor Dam in Comanche County

Area	Parameter	Category	Rank
Portion of segment north of Gustine	bacteria	5c	D
Portion of segment west of US Hwy 281	bacteria	5c	D

SegID: **1221A** **Resley Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence of the Leon River east of Gustine in Comanche County to the upstream perennial

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1222** **Proctor Lake** Category: **5c**

Water body location: From Proctor Dam in Comanche County to a point immediately upstream of the confluence of Mill Branch

Area	Parameter	Category	Rank
Rush-Copperas Creek arm of lake	depressed dissolved oxygen	5c	D
Sabana River arm of lake	depressed dissolved oxygen	5c	D

SegID: **1222A** **Duncan Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence of Proctor Lake northeast of Comanche in Comanche County to the upstream perennial portion of the stream west of Comanche in Comanche County

Area	Parameter	Category	Rank
Entire creek	bacteria	5c	D

SegID: **1226B** **Green Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence of the North Bosque River south of Clairette in Erath County to the upstream perennial portion of the stream south of Stephenville in Erath County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1226E** **Indian Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the North Bosque River in Erath County to the headwaters 3.5 miles east of Stephenville in Erath County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1226F** **Sims Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the North Bosque River in Erath County to the headwaters 6 miles southeast of Stephenville in Erath County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1227** **Nolan River** Category: **5b**

Water body location: From a point immediately upstream of the confluence of Rock Creek in Hill County to Cleburne Dam in Johnson County

Area	Parameter	Category	Rank
Lower 8 miles	sulfate	5b	S
Upper 8 miles	bacteria	5c	D
Upper 8 miles	sulfate	5b	S

SegID: **1238** **Salt Fork Brazos River** Category: **5b**

Water body location: From the confluence of the Double Mountain Fork Brazos River in Stonewall County to the most upstream crossing of SH 207 in Crosby County

Area	Parameter	Category	Rank
25 miles near Hwy 380 at Swenson	chloride	5b	S
25 miles near Hwy 380 at Swenson	total dissolved solids	5b	S
25 miles near Hwy 83	chloride	5b	S
25 miles near Hwy 83	total dissolved solids	5b	S
Remainder of segment	chloride	5b	S
Remainder of segment	total dissolved solids	5b	S

SegID: **1240** **White River Lake** Category: **5b**

Water body location: From White River Dam in Crosby County up to normal pool elevation of 2369 feet (impounds White River)

Area	Parameter	Category	Rank
Entire segment	chloride	5b	S

SegID: **1241A** **North Fork Double Mountain Fork Brazos River (unclassified water body)** Category: **5c**

Water body location: Perennial stream from the confluence with Double Mountain Fork Brazos River to the dam forming Lake Ransom Canyon

Area	Parameter	Category	Rank
Upper 3 miles	bacteria	5c	D

SegID: **1242** **Brazos River Above Navasota River** Category: **5c**

Water body location: From a point immediately upstream of the confluence of the Navasota River in Brazos/Grimes/Washington County to the low water dam forming Lake Brazos in McLennan County

Area	Parameter	Category	Rank
Downstream portion of segment	bacteria	5c	D
Portion of segment within Waco city limits	bacteria	5c	D

SegID: **1242D** **Thompson Creek (unclassified water body)** Category: **5c**

Water body location: Intermittent stream with perennial pools from the confluence with the Brazos River upstream to the

Area	Parameter	Category	Rank
Downstream portion of water body	bacteria	5c	D
Upstream portion of water body	bacteria	5c	D

SegID: **1242I** **Campbells Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the Little Brazos River upstream to the headwaters, one mile west of Old San Antonio Road

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1242K** **Mud Creek (unclassified water body)** Category: **5c**

Water body location: From confluence with the Little Brazos River, upstream to the confluence with Touchstone Branch and Wolf Den Branch, in Robertson County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1242L** **Pin Oak Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the Little Brazos River in Robertson County upstream to the headwaters, 2.07 miles south of Franklin

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1242M** **Spring Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the Little Brazos River in Robertson County, upstream to the headwaters, 1.5 miles north of FM 391

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1242N** **Tehuacana Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the Brazos River in McLennan county upstream to the headwaters 2 miles south of Penelope in Hill County

Area	Parameter	Category	Rank
Downstream portion of water body	bacteria	5c	D

SegID: **1242P** **Big Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with Little Brazos River in Falls County upstream to the confluence with unnamed creeks near Mart in the northeast corner of Falls County

Area	Parameter	Category	Rank
Upper 33.5 miles	bacteria	5c	D

SegID: **1243** **Salado Creek** Category: **5c**

Water body location: From the confluence with the Lampasas River in Bell County to the confluence of North Salado Creek and South Salado Creek in Williamson County

Area	Parameter	Category	Rank
Lower end of segment to FM 2268	depressed dissolved oxygen	5c	D

SegID: **1245** **Upper Oyster Creek** Category: **5a**

Water body location: From Steep Bank Creek/Brazos River confluence in Fort Bend County to pumping station on Jones Creek confluence at Brazos River in Fort Bend County (includes portions of Steep Bank Creek, Flat Bank Creek, and Jones Creek)

Area	Parameter	Category	Rank
From Dam #1 to Oyster Creek/Jones Creek confluence	depressed dissolved oxygen	5c	D
From Dam #3, just upstream of Lexington Blvd. to the Brooks Lake outfall	depressed dissolved oxygen	5c	D
From Hwy 90A to Dam #1, located 1.5 miles upstream of Harmon St.	bacteria	5a	U
From Hwy 90A to Dam #1, located 1.5 miles upstream of Harmon St.	depressed dissolved oxygen	5c	D
From Oyster Creek/Jones Creek confluence to upper end of segment	depressed dissolved oxygen	5c	D
From lower end of segment to Dam #3, just upstream of Lexington Blvd.	depressed dissolved oxygen	5c	D
From the Brooks Lake outfall to Hwy 90A	depressed dissolved oxygen	5c	D

SegID: **1246E** **Wasp Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with Tonk Creek in Crawford in McLennan County, upstream to the headwaters in Coryell County, 0.15 mile east of FM 185

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1247A** **Willis Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the headwaters of Granger Lake in Williamson County to CR 313 in Williamson County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1248** **San Gabriel/North Fork San Gabriel River** Category: **5c**

Water body location: From point 1.9 km (1.2 miles) downstream of SH 95 in Williamson County to North San Gabriel Dam in Williamson County

Area	Parameter	Category	Rank
From confluence of South Fork San Gabriel River to North San Gabriel Dam	total dissolved solids	5c	D
From confluence with Weir Branch to confluence with South Fork San Gabriel	total dissolved solids	5c	D
From lower end of segment to the confluence with Weir Branch	total dissolved solids	5c	D

SegID: **1248C** **Mankins Branch (unclassified water body)** Category: **5c**

Water body location: Perennial stream from the confluence with the San Gabriel River in Williamson County to the intersection of CR 105 and 104 in Williamson County

Area	Parameter	Category	Rank
Lower 2.5 miles	bacteria	5c	D
Upper 2.5 miles	bacteria	5c	D

SegID: **1254** **Aquilla Reservoir** Category: **5c**

Water body location: From Aquilla Dam in Hill County up to the normal pool elevation of 537.5 feet (impounds Aquilla Creek)

Area	Parameter	Category	Rank
Aquilla Creek arm on the west	depressed dissolved oxygen	5c	D
Hackberry Creek arm on the east	depressed dissolved oxygen	5c	D
South end of reservoir near dam	depressed dissolved oxygen	5c	D

SegID: **1255** **Upper North Bosque River** Category: **5c**

Water body location: From a point immediately above the confluence of Indian Creek in Erath County to the confluence of the North Fork and South Fork of the Bosque River in Erath County

Area	Parameter	Category	Rank
Downstream portion of segment	bacteria	5c	D
Upstream portion of segment	bacteria	5c	D

SegID: **1255A** **Goose Branch (unclassified water body)** Category: **5a**

Water body location: From the confluence with the south fork of the North Bosque River 2.5 miles (4.0 km) west of Stephenville,

Area	Parameter	Category	Rank
Entire water body	bacteria	5a	L

SegID: **1255B** **North Fork Upper North Bosque River (unclassified water body)** Category: **5c**

Water body location: From the confluence with the South Fork of the Upper North Bosque River in Stephenville, upstream to the headwaters, 2.0 miles north of FM 219

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1255C** **Scarborough Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with the North Fork of the upper North Bosque River, upstream to the headwaters 0.1 miles (0.2 km) southeast of FM 219 in Erath County

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1255D** **South Fork North Bosque River (unclassified water body)** Category: **5c**

Water body location: From the confluence with the North Fork of the upper North Bosque River in Stephenville, upstream to the headwaters 3 miles (4.8 km) north of FM 219 in Erath County

Area	Parameter	Category	Rank
Downstream portion of water body	bacteria	5c	D
Upstream portion of water body	bacteria	5c	D

SegID: **1255E** **Unnamed tributary of Goose Branch (unclassified water body)** Category: **5a**

Water body location: From the confluence with Goose Branch in Erath County to its headwaters, 0.2 miles southeast of the

Area	Parameter	Category	Rank
Entire water body	bacteria	5a	L

SegID: **1255F** **Unnamed tributary of Scarborough Creek (unclassified water body)** Category: **5c**

Water body location: From the confluence with Scarborough Creek, 1.0 mile west of SH 108 in Erath County, upstream to the

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1255G** **Woodhollow Branch (unclassified water body)** Category: **5c**

Water body location: From the confluence with the South Fork of the North Bosque River, 6 miles northwest of Stephenville,

Area	Parameter	Category	Rank
Entire water body	bacteria	5c	D

SegID: **1302** **San Bernard River Above Tidal** Category: **5c**

Water body location: From a point 3.2 km (2.0 miles) upstream of SH 35 in Brazoria County to the county road southeast of New Ulm in Austin County

Area	Parameter	Category	Rank
Lower 50 miles	bacteria	5c	D

SegID: **1305** **Caney Creek Above Tidal** Category: **5b**

Water body location: From a point 1.9 km (1.2 miles) upstream of the confluence of Linnville Bayou in Matagorda County to Old Caney Road in Wharton County

Area	Parameter	Category	Rank
25 miles surrounding SH 35	bacteria	5c	D
25 miles surrounding SH 35	depressed dissolved oxygen	5b	S

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

Neches River Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0601 Neches River Tidal	0601A Star Lake Canal	0602 Neches River Below B. A. Steinhagen Lake	0602A Booger Branch	0603 B. A. Steinhagen Lake	0603A Sandy Creek	0603B Wolf Creek	0604 Neches River Below Lake Palestine	0604A Cedar Creek	0604B Hurricane Creek	0604C Jack Creek	0604D Piney Creek
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	FS	NA	NA	**NS**	FS	FS	FS	**NS**	**NS**	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	FS	X	FS	X	X	FS	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	**NS**	NA	FS	FS	FS	FS	FS	FS	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	FS	NA	FS	NA	NA	NA	NA	**NS**	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	FS	NA	FS	NA	**PS**	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	FS	NA	NA	NA	NA	FS	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	X	FS	X	NA	X	X	FS	X	X	X	X
pH	FS	X	FS	X	NA	X	X	FS	X	X	X	X
Chloride	X	X	FS	X	NA	X	X	FS	X	X	X	X
Sulfate	X	X	FS	X	NA	X	X	FS	X	X	X	X
Total Dissolved Solids	X	X	FS	X	NA	X	X	FS	X	X	X	X

Neches River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0604H One Eye Creek	0604 Biloxi Creek	0604N Buck Creek	0604T Lake Ratcliff	0605 Lake Palestine	0605A Kickapoo Creek	0606 Neches River Above Lake Palestine	0606A Prairie Creek	0607 Pine Island Bayou	0607A Boggy Creek	0607B Little Pine Island Bayou	0607C Willow Creek
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	FS	FS	NA	FS	**NS**	FS	**NS**	FS	NA	FS	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	FS	X	FS	X	FS	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	NA	FS	FS	FS	FS	**PS**	FS	**PS**	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	**NS**	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	**PS**	FS	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	X	X	FS	X	FS	X	FS	X	X	X
pH	X	X	X	X	FS	X	**PS**	X	FS	X	X	X
Chloride	X	X	X	X	FS	X	FS	X	FS	X	X	X
Sulfate	X	X	X	X	FS	X	FS	X	FS	X	X	X
Total Dissolved Solids	X	X	X	X	FS	X	FS	X	FS	X	X	X

Neches River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0608 Village Creek	0608A Beech Creek	0608B Big Sandy Creek	0608C Cypress Creek	0608D Hickory Creek	0608E Mill Creek	0608F Turkey Creek	0608G Lake Kimball	0609 Angelina River Below Sam Rayburn Reservoir	0610 Sam Rayburn Reservoir	0610A Ayish Bayou	0611 Angelina River Above Sam Rayburn Reservoir
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	**NS**	FS	FS	NA	**NS**	NA	FS	FS	FS	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	X	X	X	X	X	X	X	FS	FS	X	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	NA	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	FS	FS	NA	FS
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	FS
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	**PS**	NA	**PS**	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	FS	FS	NA	FS
GENERAL USE SUPPORT												
Water Temperature	FS	X	X	X	X	X	X	X	FS	FS	X	FS
pH	**PS**	X	X	X	X	X	X	X	FS	FS	X	FS
Chloride	FS	X	X	X	X	X	X	X	FS	FS	X	FS
Sulfate	FS	X	X	X	X	X	X	X	FS	FS	X	FS
Total Dissolved Solids	FS	X	X	X	X	X	X	X	FS	FS	X	FS

Neches River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0611A East Fork Angelina River	0611B La Nana Bayou	0611C Mud Creek	0611D West Mud Creek	0611H Ragsdale Creek	0611Q Lake Nacogdoches	0612 Attoyac Bayou	0612B Waffelow Creek	0612C Pinkston Reservoir	0613 Lake Tyler/Lake Tyler East	0614 Lake Jacksonville	0615 Angelina River/Sam Rayburn Reservoir
DESIGNATED USE SUPPORT												
Contact Recreation Use	**NS**	**NS**	**NS**	FS	NA	NA	FS	NA	NA	FS	NA	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	FS	FS	X	FS	FS	FS	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	NA	FS	NA	NA	FS	NA	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA	FS
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	FS
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**NS**
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**PS**
Human Health Criteria	NA	NA	NA	NA	NA	NA	FS	NA	NA	FS	NA	FS
GENERAL USE SUPPORT												
Water Temperature	X	X	X	X	X	X	FS	X	X	FS	NA	FS
pH	X	X	X	X	X	X	FS	X	X	FS	NA	FS
Chloride	X	X	X	X	X	X	FS	X	X	FS	FS	FS
Sulfate	X	X	X	X	X	X	FS	X	X	FS	FS	FS
Total Dissolved Solids	X	X	X	X	X	X	FS	X	X	FS	FS	FS

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0615A Papermill Creek
DESIGNATED USE SUPPORT	
Contact Recreation Use	FS
Noncontact Recreation Use	X
Public Water Supply Use	X
Aquatic Life Use	
Dissolved Oxygen grab min	FS
Dissolved Oxygen 24-hour avg	NA
Dissolved Oxygen 24-hour min	NA
Metals in water	FS
Organics in water	NA
Water Toxicity Tests	NA
Sediment Toxicity Tests	NA
Habitat	NA
Macrobenthos Community	NA
Fish Community	NA
Fish Consumption Use	
Advisories and Closures	NA
Human Health Criteria	FS
GENERAL USE SUPPORT	
Water Temperature	X
pH	X
Chloride	X
Sulfate	X
Total Dissolved Solids	X

Neches River Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0601 Neches River Tidal	0601A Star Lake Canal	0602 Neches River Below B. A. Steinhagen Lake	0602A Booger Branch	0603 B. A. Steinhagen Lake	0603A Sandy Creek	0603B Wolf Creek	0604 Neches River Below Lake Palestine	0604A Cedar Creek	0604B Hurricane Creek	0604C Jack Creek	0604D Piney Creek
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NA	NA	NC	NC	NC	**C**	**C**	**C**	NC
Nitrite + Nitrate Nitrogen	NC	**C**	NC	NA	NA	NC	NC	NC	**C**	NC	**C**	NC
Orthophosphorus	NC	**C**	NC	NA	NA	NA	NA	NC	NA	NA	NA	NA
Total Phosphorus	NC	**C**	NC	NA	NA	NA	NA	NC	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NC	NC	NC	NA	NA	NA	NA	NC	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	NC	X	NC	X	X	NC	X	X	X	X
Finished Water: Sulfate	X	X	NC	X	NC	X	X	NC	X	X	X	X
Finished Water: TDS	X	X	NC	X	NC	X	X	NC	X	X	X	X
Surface Water: Chloride	X	X	NC	X	NA	X	X	NC	X	X	X	X
Surface Water: Sulfate	X	X	NC	X	NA	X	X	NC	X	X	X	X
Surface Water: TDS	X	X	NC	X	NA	X	X	NC	X	X	X	X

Neches River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0604H One Eye Creek	0604 Biloxi Creek	0604N Buck Creek	0604T Lake Ratcliff	0605 Lake Palestine	0605A Kickapoo Creek	0606 Neches River Above Lake Palestine	0606A Prairie Creek	0607 Pine Island Bayou	0607A Boggy Creek	0607B Little Pine Island Bayou	0607C Willow Creek
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NC	NC	NA	**C**	**C**	NC	NA	NC	NA	NC	NC
Nitrite + Nitrate Nitrogen	NA	NC	NC	NA	**C**	NC	**C**	NA	NC	NA	NC	NC
Orthophosphorus	NA	NA	NA	NA	NC	NA	NC	NA	NC	NA	NA	NA
Total Phosphorus	NA	NA	NA	NA	NC	NA	NC	NA	NC	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NA	NC	NA	NC	NA	NC	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	X	X	NC	X	NC	X	NC	X	X	X
Finished Water: Sulfate	X	X	X	X	NC	X	NC	X	NC	X	X	X
Finished Water: TDS	X	X	X	X	NC	X	NC	X	NC	X	X	X
Surface Water: Chloride	X	X	X	X	NC	X	NC	X	NC	X	X	X
Surface Water: Sulfate	X	X	X	X	NC	X	NC	X	NC	X	X	X
Surface Water: TDS	X	X	X	X	NC	X	NC	X	NC	X	X	X

Neches River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0608 Village Creek	0608A Beech Creek	0608B Big Sandy Creek	0608C Cypress Creek	0608D Hickory Creek	0608E Mill Creek	0608F Turkey Creek	0608G Lake Kimball	0609 Angelina River Below Sam Rayburn Reservoir	0610 Sam Rayburn Reservoir	0610A Ayish Bayou	0611 Angelina River Above Sam Rayburn Reservoir
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	**C**	NA	NC	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NC	NC	NA	NC	NA	NC	NC	NA	NC
Nitrite + Nitrate Nitrogen	NC	NC	NC	NC	NC	NA	NC	NA	NC	NC	NA	NC
Orthophosphorus	NC	NA	NA	NA	NA	NA	NA	NA	NC	NC	NA	NC
Total Phosphorus	NC	NA	NA	NA	NA	NA	NA	NA	NC	**C**	NA	NC
Algal Growth												
Chlorophyll *a*	NC	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NC
Public Water Supply												
Finished Water: Chloride	NC	X	X	X	X	X	X	X	NC	NC	X	NC
Finished Water: Sulfate	NC	X	X	X	X	X	X	X	NC	NC	X	NC
Finished Water: TDS	NC	X	X	X	X	X	X	X	NC	NC	X	NC
Surface Water: Chloride	NC	X	X	X	X	X	X	X	NC	NC	X	NC
Surface Water: Sulfate	NC	X	X	X	X	X	X	X	NC	NC	X	NC
Surface Water: TDS	NC	X	X	X	X	X	X	X	NC	NC	X	NC

Neches River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0611A East Fork Angelina River	0611B La Nana Bayou	0611C Mud Creek	0611D West Mud Creek	0611H Ragsdale Creek	0611Q Lake Nacogdoches	0612 Attoyac Bayou	0612B Waffelow Creek	0612C Pinkston Reservoir	0613 Lake Tyler/Lake Tyler East	0614 Lake Jacksonville	0615 Angelina River/Sam Rayburn Reservoir
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NC	NA	NA	NC	NC	NA	NC
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	**C**
Nutrient Enrichment												
Ammonia Nitrogen	NC	**C**	NC	NC	NA	NA	NC	NA	NA	NC	NA	**C**
Nitrite + Nitrate Nitrogen	NC	NC	NC	**C**	NA	NA	NC	NA	NA	NC	NA	**C**
Orthophosphorus	NA	NA	NA	NA	NA	NA	NC	NA	NA	NC	NA	**C**
Total Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	**C**
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NC
Public Water Supply												
Finished Water: Chloride	X	X	X	X	X	NC	NC	X	NC	NC	NC	NC
Finished Water: Sulfate	X	X	X	X	X	NC	NC	X	NC	NC	NC	NC
Finished Water: TDS	X	X	X	X	X	NC	NC	X	NC	NC	NC	NC
Surface Water: Chloride	X	X	X	X	X	NA	NC	X	NA	NC	NC	NC
Surface Water: Sulfate	X	X	X	X	X	NA	NC	X	NA	NC	NC	NC
Surface Water: TDS	X	X	X	X	X	NA	NC	X	NA	NC	NC	NC

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0615A Papermill Creek
WATER QUALITY CONCERNS	
Sediment Contaminants	NA
Fish Tissue Contaminants	NA
Narrative	**C**
Nutrient Enrichment	
Ammonia Nitrogen	**C**
Nitrite + Nitrate Nitrogen	NC
Orthophosphorus	**C**
Total Phosphorus	**C**
Algal Growth	
Chlorophyll *a*	NC
Public Water Supply	
Finished Water: Chloride	X
Finished Water: Sulfate	X
Finished Water: TDS	X
Surface Water: Chloride	X
Surface Water: Sulfate	X
Surface Water: TDS	X

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

Neches-Trinity Coastal Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0701 Taylor Bayou Above Tidal	0701D Shallow Prong Lake	0702 Intracoastal Waterway Tidal	0702A Alligator Bayou	0703 Sabine-Neches Canal Tidal	0704 Hillebrandt Bayou	0704A Willow Marsh Bayou	0704B Kidd Gully	0704C Pevitot Gully
DESIGNATED USE SUPPORT									
Contact Recreation Use	FS	NA	FS	FS	FS	FS	NA	NA	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	X	X	X	X
Aquatic Life Use									
Dissolved Oxygen grab min	FS	NA	FS	FS	FS	FS	FS	FS	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	FS	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	FS	NA	NA	**NS**	NA	NA	NA	NA	NA
Fish Consumption Use									
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT									
Water Temperature	FS	X	FS	X	FS	FS	X	X	X
pH	FS	X	FS	X	FS	FS	X	X	X
Chloride	FS	X	X	X	X	FS	X	X	X
Sulfate	FS	X	X	X	X	FS	X	X	X
Total Dissolved Solids	FS	X	X	X	X	FS	X	X	X

Neches-Trinity Coastal Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0701 Taylor Bayou Above Tidal	0701D Shallow Prong Lake	0702 Intracoastal Waterway Tidal	0702A Alligator Bayou	0703 Sabine-Neches Canal Tidal	0704 Hillebrandt Bayou	0704A Willow Marsh Bayou	0704B Kidd Gully	0704C Pevitot Gully
WATER QUALITY CONCERNS									
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NC	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	**C**	NC	NC	NC	NC	NC
Nutrient Enrichment									
Ammonia Nitrogen	NC	NA	NC	NC	NC	**C**	NA	NA	NA
Nitrite + Nitrate Nitrogen	NC	NA	NC	NC	NC	NC	NA	NA	NA
Orthophosphorus	NC	NA	NC	NC	NC	NC	NA	NA	NA
Total Phosphorus	NC	NA	NC	NC	NC	NC	NA	NA	NA
Algal Growth									
Chlorophyll *a*	**C**	NA	NC	**C**	NC	**C**	NA	NA	NA
Public Water Supply									
Finished Water: Chloride	X	X	X	X	X	X	X	X	X
Finished Water: Sulfate	X	X	X	X	X	X	X	X	X
Finished Water: TDS	X	X	X	X	X	X	X	X	X
Surface Water: Chloride	X	X	X	X	X	X	X	X	X
Surface Water: Sulfate	X	X	X	X	X	X	X	X	X
Surface Water: TDS	X	X	X	X	X	X	X	X	X

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

Trinity River Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0801 Trinity River Tidal	0802 Trinity River Below Lake Livingston	0803 Lake Livingston	0803A Harmon Creek	0804 Trinity River Above Lake Livingston	0804F Tehuacana Creek	0805 Upper Trinity River	0806 West Fork Trinity River Below Lake Worth	0806A Fosdic Lake	0806B Echo Lake	0807 Lake Worth	0808 West Fork Trinity River Below Eagle Mtn. Res.
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	FS	FS	FS	NA	FS	NA	NA	NA	NA	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	FS	FS	X	X	X	X	FS	X	X	FS	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	FS	NA	NA	NA	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	FS	FS	FS	FS	FS	FS	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	FS	NA	NA	NA	**NS**	**NS**	**NS**	**NS**	**NS**	NA
Human Health Criteria	NA	FS	FS	NA	FS	FS	FS	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	FS	FS	X	FS	X	FS	FS	X	X	NA	NA
pH	FS	FS	**PS**	X	FS	X	FS	FS	X	X	NA	NA
Chloride	X	FS	FS	X	FS	X	FS	NA	X	X	NA	NA
Sulfate	X	FS	FS	X	FS	X	FS	NA	X	X	NA	NA
Total Dissolved Solids	X	FS	FS	X	FS	X	FS	FS	X	X	NA	NA

Trinity River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Eagle Mountain Reservoir 0809	West Fork Trinity River Below Bridgeport Res. 0810	Bridgeport Reservoir 0811	West Fork Trinity River Above Bridgeport Res. 0812	Houston County Lake 0813	Chambers Creek Above Richland-Chambers Res. 0814	Bardwell Reservoir 0815	Waxahachie Creek 0815A	Lake Waxahachie 0816	Navarro Mills Lake 0817	Cedar Creek Reservoir 0818	East Fork Trinity River 0819
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	**NS**	FS	NA	NA	NA	NA	NA	NA	NA	FS	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	FS	FS	FS	FS	FS	FS	X	FS	FS	FS	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	NA	NA	FS	FS	NA	NA	NA	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	FS	NA	FS	NA	NA	FS	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	FS	NA	FS	NA	NA	FS	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	FS	FS	NA	NA	FS	FS	X	NA	NA	FS	FS
pH	FS	FS	FS	NA	NA	FS	FS	X	NA	NA	**NS**	FS
Chloride	FS	FS	FS	NA	NA	FS	NA	X	NA	NA	FS	FS
Sulfate	FS	FS	FS	NA	NA	FS	NA	X	NA	NA	FS	FS
Total Dissolved Solids	FS	FS	FS	NA	NA	FS	FS	X	NA	NA	FS	FS

Trinity River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0820 Lake Ray Hubbard	0820C Muddy Creek	0821 Lake Lavon	0821A Pilot Grove Creek	0821B Sister Grove Creek	0822 Elm Fork Trinity River Below Lewisville Lake	0823 Lewisville Lake	0823A Little Elm Creek	0823B Stewart Creek	0823C Clear Creek	0824 Elm Fork Trinity River Above Ray Roberts Lake	0825 Denton Creek
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	**NS**	NA	NA	NA	FS	NA	**NS**	NA	FS	**NS**	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	X	FS	X	X	FS	FS	X	X	X	X	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	FS	NA	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	FS	FS	FS	NA	NA	NA	NA	FS	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	FS	FS	NA	FS	FS	FS	FS	NA	NA	NA	FS	NA
GENERAL USE SUPPORT												
Water Temperature	FS	X	FS	X	X	FS	FS	X	X	X	FS	FS
pH	FS	X	FS	X	X	FS	FS	X	X	X	FS	FS
Chloride	FS	X	FS	X	X	FS	FS	X	X	X	FS	FS
Sulfate	NA	X	FS	X	X	FS	FS	X	X	X	FS	FS
Total Dissolved Solids	FS	X	NA	X	X	FS	FS	X	X	X	FS	FS

Trinity River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	0826 Grapevine Lake	0826A Denton Creek	0827 White Rock Lake	0828 Lake Arlington	0828A Village Creek	0829 Clear Fork Trinity River Below Benbrook Lake	0829A Lake Como	0830 Benbrook Lake	0831 Clear Fork Trinity River Below Lake Weatherford	0832 Lake Weatherford	0833 Clear Frk. Trinity R. Above L. Weatherford	0834 Lake Amon G. Carter
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	FS	NA	NA	NA	FS	NA	FS	**NS**	NA	NA	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	X	X	FS	X	FS	X	FS	FS	FS	FS	FS
Aquatic Life Use												
Dissolved Oxygen grab min	NA	FS	NA	FS	FS	FS	NA	FS	FS	NA	**PS**	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	FS	FS	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	**NS**	**NS**	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	FS	FS	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	NA	X	NA	NA	X	FS	X	FS	FS	NA	FS	NA
pH	NA	X	NA	FS	X	FS	X	FS	FS	NA	FS	NA
Chloride	NA	X	NA	FS	X	FS	X	FS	FS	NA	NA	NA
Sulfate	NA	X	NA	FS	X	FS	X	FS	FS	NA	NA	NA
Total Dissolved Solids	FS	X	NA	FS	X	FS	X	FS	FS	NA	FS	NA

Trinity River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Richland Creek Below Richland-Chambers Res. 0835	Richland-Chambers Reservoir 0836	Richland Creek Above Richland-Chambers Res. 0837	Joe Pool Lake 0838	Elm Fork Trinity River Below Ray Roberts Lake 0839	Ray Roberts Lake 0840	Unnamed tributary of Jordan Creek 0840A	Lower West Fork Trinity River 0841	Mountain Creek Lake 0841A
DESIGNATED USE SUPPORT									
Contact Recreation Use	NA	FS	FS	NA	NA	FS	NA	NA	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	FS	FS	FS	FS	FS	X	X	FS
Aquatic Life Use									
Dissolved Oxygen grab min	NA	FS	FS	FS	NA	FS	FS	FS	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	FS	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity Tests	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use									
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	**NS**	**NS**
Human Health Criteria	NA	FS	NA	FS	NA	FS	NA	NA	NA
GENERAL USE SUPPORT									
Water Temperature	NA	FS	FS	FS	NA	FS	X	FS	X
pH	NA	**PS**	FS	FS	NA	FS	X	FS	X
Chloride	NA	FS	FS	NA	NA	FS	X	FS	X
Sulfate	NA	FS	FS	FS	NA	FS	X	FS	X
Total Dissolved Solids	NA	FS	FS	FS	NA	FS	X	FS	X

Trinity River Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0801 Trinity River Tidal	0802 Trinity River Below Lake Livingston	0803 Lake Livingston	0803A Harmon Creek	0804 Trinity River Above Lake Livingston	0804F Tehuacana Creek	0805 Upper Trinity River	0806 West Fork Trinity River Below Lake Worth	0806A Fosdic Lake	0806B Echo Lake	0807 Lake Worth	0808 West Fork Trinity River Below Eagle Mtn. Res.
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NC	NA	NA	NA	NA	NC	NC	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NC	NC	NC	**C**	NC	NA	NA	NA	NA
Nitrite + Nitrate Nitrogen	NC	NC	**C**	NC	**C**	NC	**C**	NC	NA	NA	NA	NA
Orthophosphorus	NC	NC	**C**	**C**	**C**	NC	**C**	NC	NA	NA	NA	NA
Total Phosphorus	NC	NC	**C**	**C**	**C**	NA	**C**	NC	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NC	NC	**C**	NA	**C**	NA	NC	**C**	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	NC	NC	X	X	X	X	NC	X	X	NC	NC
Finished Water: Sulfate	X	NC	NC	X	X	X	X	NC	X	X	NC	NC
Finished Water: TDS	X	NC	NC	X	X	X	X	NC	X	X	NC	NC
Surface Water: Chloride	X	NC	NC	X	X	X	X	NA	X	X	NA	NA
Surface Water: Sulfate	X	NC	NC	X	X	X	X	NA	X	X	NA	NA
Surface Water: TDS	X	NC	NC	X	X	X	X	NC	X	X	NA	NA

Trinity River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Eagle Mountain Reservoir 0809	West Fork Trinity R. Below Bridgeport Res. 0810	Bridgeport Reservoir 0811	West Fork Trinity River Above Bridgeport Res. 0812	Houston County Lake 0813	Chambers Creek Above Richland-Chambers Res. 0814	Bardwell Reservoir 0815	Waxahachie Creek 0815A	Lake Waxahachie 0816	Navarro Mills Lake 0817	Cedar Creek Reservoir 0818	East Fork Trinity River 0819
WATER QUALITY CONCERNS												
Sediment Contaminants	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NC	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	**C**	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NA	NA	NC	NC	NA	NA	NA	**C**	**C**
Nitrite + Nitrate Nitrogen	NC	NC	NC	NA	NA	NC	**C**	NA	NA	NA	NC	**C**
Orthophosphorus	NC	NC	NC	NA	NA	NC	NC	NA	NA	NA	**C**	**C**
Total Phosphorus	**C**	NC	NC	NA	NA	NA	NA	NA	NA	NA	**C**	NA
Algal Growth												
Chlorophyll *a*	**C**	NC	NC	NA	NA	NA	NA	NA	NA	NA	**C**	NA
Public Water Supply												
Finished Water: Chloride	NC	NC	NC	NC	NC	NC	NC	X	NC	NC	NC	X
Finished Water: Sulfate	NC	NC	NC	NC	NC	NC	NC	X	NC	NC	NC	X
Finished Water: TDS	NC	NC	NC	NC	NC	NC	NC	X	NC	NC	NC	X
Surface Water: Chloride	NC	NC	NC	NA	NA	NC	NA	X	NA	NA	NC	X
Surface Water: Sulfate	NC	NC	NC	NA	NA	NC	NA	X	NA	NA	NC	X
Surface Water: TDS	NC	NC	NC	NA	NA	NC	NC	X	NA	NA	NC	X

Trinity River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0820 Lake Ray Hubbard	0820C Muddy Creek	0821 Lake Lavon	0821A Pilot Grove Creek	0821B Sister Grove Creek	0822 Elm Fork Trinity River Below Lewisville Lake	0823 Lewisville Lake	0823A Little Elm Creek	0823B Stewart Creek	0823C Clear Creek	0824 Elm Fork Trinity River Above Ray Roberts Lake	0825 Denton Creek
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	**C**	NC
Nutrient Enrichment												
Ammonia Nitrogen	**C**	**C**	NC	NC	NC	**C**	**C**	**C**	NA	NC	**C**	NC
Nitrite + Nitrate Nitrogen	**C**	**C**	**C**	NC	NC	NC	**C**	NC	NA	NC	**C**	NC
Orthophosphorus	NC	NC	NC	NC	NC	NC	NC	NC	NA	NC	**C**	NC
Total Phosphorus	NC	NC	NA	NA	NA	NC	NC	NC	NA	NC	**C**	NA
Algal Growth												
Chlorophyll *a*	**C**	NA	NA	NA	NA	**C**	NC	NA	NA	NA	**C**	NA
Public Water Supply												
Finished Water: Chloride	NC	X	NC	X	X	NC	NC	X	X	X	X	NC
Finished Water: Sulfate	NC	X	NC	X	X	NC	NC	X	X	X	X	NC
Finished Water: TDS	NC	X	NC	X	X	NC	NC	X	X	X	X	NC
Surface Water: Chloride	NC	X	NC	X	X	NC	NC	X	X	X	X	NC
Surface Water: Sulfate	NA	X	NC	X	X	NC	NC	X	X	X	X	NC
Surface Water: TDS	NC	X	NA	X	X	NC	NC	X	X	X	X	NC

Trinity River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	0826 Grapevine Lake	0826A Denton Creek	0827 White Rock Lake	0828 Lake Arlington	0828A Village Creek	0829 Clear Fork Trinity River Below Benbrook Lake	0829A Lake Como	0830 Benbrook Lake	0831 Clear Fork Trinity River Below Lake Weatherford	0832 Lake Weatherford	0833 Clear Frk. Trinity R. Above L. Weatherford	0834 Lake Amon G. Carter
WATER QUALITY CONCERNS												
Sediment Contaminants	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	**C**	NA	NC	NC	NC	NA	**C**	NC	NA	NC	NA
Nitrite + Nitrate Nitrogen	NC	NC	NA	NC	NC	NC	NA	NC	NC	NA	NC	NA
Orthophosphorus	NC	NC	NA	NC	NC	NC	NA	NC	**C**	NA	NC	NA
Total Phosphorus	NC	NC	NA	NA	NA	NC	NA	NC	NC	NA	NC	NA
Algal Growth												
Chlorophyll *a*	NC	NA	NA	NA	NA	NC	NA	**C**	NC	NA	NC	NA
Public Water Supply												
Finished Water: Chloride	NC	X	X	NC	X	NC	X	NC	NC	NC	NC	NC
Finished Water: Sulfate	NC	X	X	NC	X	NC	X	NC	NC	NC	NC	NC
Finished Water: TDS	NC	X	X	NC	X	NC	X	NC	NC	NC	NC	NC
Surface Water: Chloride	NA	X	X	NC	X	NC	X	NC	NC	NA	NA	NA
Surface Water: Sulfate	NA	X	X	NC	X	NC	X	NC	NC	NA	NA	NA
Surface Water: TDS	NC	X	X	NC	X	NC	X	NC	NC	NA	NA	NA

Trinity River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Richland Cr. Below Richland-Chambers Res. 0835	Richland-Chambers Reservoir 0836	Richland Creek Above Richland-Chambers Res. 0837	Joe Pool Lake 0838	Elm Fork Trinity River Below Ray Roberts Lake 0839	Ray Roberts Lake 0840	Unnamed tributary of Jordan Creek 0840A	Lower West Fork Trinity River 0841	Mountain Creek Lake 0841A
WATER QUALITY CONCERNS									
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NC	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment									
Ammonia Nitrogen	NA	NC	NC	NA	NA	**C**	**C**	NC	NA
Nitrite + Nitrate Nitrogen	NA	**C**	NC	NA	NA	**C**	NC	**C**	NA
Orthophosphorus	NA	NC	NC	NA	NA	**C**	**C**	**C**	NA
Total Phosphorus	NA	NC	NC	NA	NA	**C**	NA	**C**	NA
Algal Growth									
Chlorophyll *a*	NA	**C**	NC	NA	NA	NC	NA	NC	NA
Public Water Supply									
Finished Water: Chloride	NC	NC	NC	NC	NC	NC	X	X	NC
Finished Water: Sulfate	NC	NC	NC	NC	NC	NC	X	X	NC
Finished Water: TDS	NC	NC	NC	NC	NC	NC	X	X	NC
Surface Water: Chloride	NA	NC	NC	NA	NA	NC	X	X	NA
Surface Water: Sulfate	NA	NC	NC	NC	NA	NC	X	X	NA
Surface Water: TDS	NA	NC	NC	NC	NA	NC	X	X	NA

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

Trinity-San Jacinto Coastal Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Cedar Bayou Tidal 0901	Cedar Bayou Above Tidal 0902
DESIGNATED USE SUPPORT		
Contact Recreation Use	FS	FS
Noncontact Recreation Use	X	X
Public Water Supply Use	X	FS
Aquatic Life Use		
Dissolved Oxygen grab min	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA
Dissolved Oxygen 24-hour min	NA	NA
Metals in water	NA	NA
Organics in water	NA	NA
Water Toxicity Tests	NA	NA
Sediment Toxicity Tests	NA	NA
Habitat	NA	NA
Macrobenthos Community	NA	NA
Fish Community	NA	NA
Fish Consumption Use		
Advisories and Closures	**NS**	NA
Human Health Criteria	NA	NA
GENERAL USE SUPPORT		
Water Temperature	FS	FS
pH	FS	FS
Chloride	X	FS
Sulfate	X	FS
Total Dissolved Solids	X	FS

Trinity-San Jacinto Coastal Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Cedar Bayou Tidal 0901	Cedar Bayou Above Tidal 0902
WATER QUALITY CONCERNS		
Sediment Contaminants	NA	NA
Fish Tissue Contaminants	NA	NA
Narrative	NC	NC
Nutrient Enrichment		
Ammonia Nitrogen	NC	NC
Nitrite + Nitrate Nitrogen	NC	NC
Orthophosphorus	NC	NC
Total Phosphorus	NC	NC
Algal Growth		
Chlorophyll *a*	NC	NC
Public Water Supply		
Finished Water: Chloride	X	NC
Finished Water: Sulfate	X	NC
Finished Water: TDS	X	NC
Surface Water: Chloride	X	NC
Surface Water: Sulfate	X	NC
Surface Water: TDS	X	NC

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

San Jacinto River Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	San Jacinto River Tidal 1001	Lake Houston 1002	Luce Bayou 1002B	East Fork San Jacinto River 1003	West Fork San Jacinto River 1004	Houston Ship Ch./San Jacinto River Tidal 1005	Houston Ship Channel Tidal 1006	Halls Bayou Below US 59 1006D	Halls Bayou Above US 59 1006E	Big Gulch Above Tidal 1006F	Spring Gully Above Tidal 1006H	Unnamed Tributary of Halls Bayou 1006I
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	FS	FS	**NS**	X	X	**NS**	**NS**	**NS**	**NS**	**NS**
Noncontact Recreation Use	X	X	X	X	X	FS	X	X	X	X	X	X
Public Water Supply Use	X	FS	X	FS	FS	X	X	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	NA	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	FS	FS	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	**NS**	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	**NS**	FS	NA	NA	NA	**NS**	**NS**	NA	NA	NA	NA	NA
Human Health Criteria	FS	FS	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	FS	X	FS	FS	FS	FS	X	X	X	X	X
pH	FS	FS	X	FS	FS	FS	FS	X	X	X	X	X
Chloride	X	FS	X	FS	FS	X	X	X	X	X	X	X
Sulfate	X	FS	X	FS	FS	X	X	X	X	X	X	X
Total Dissolved Solids	X	FS	X	FS	FS	X	X	X	X	X	X	X

San Jacinto River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Unnamed Tributary of Halls Bayou 1006J	Houston Ship Ch./ Buffalo Bayou Tidal 1007	Brays Bayou Above Tidal 1007B	Keegans Bayou Above Tidal 1007C	Sims Bayou Above Tidal 1007D	Willow Waterhole Bayou Above Tidal 1007E	Berry Bayou Above Tidal 1007F	Kuhlman Gully Above Tidal 1007G	Pine Gully Above Tidal 1007H	Plum Creek Above Tidal 1007I	Country Club Bayou Above Tidal 1007K	Unnamed Non-Tidal Trib. of Brays Bayou 1007L
DESIGNATED USE SUPPORT												
Contact Recreation Use	**NS**	X	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	X	X	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	FS	**NS**	**NS**	**NS**	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	**PS**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	**NS**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	FS	X	X	X	X	X	X	X	X	X	X
pH	X	FS	X	X	X	X	X	X	X	X	X	X
Chloride	X	X	X	X	X	X	X	X	X	X	X	X
Sulfate	X	X	X	X	X	X	X	X	X	X	X	X
Total Dissolved Solids	X	X	X	X	X	X	X	X	X	X	X	X

Trinity River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Unnamed Non-Tidal Trib. of Hunting Bayou 1007M	Unnamed Non-Tidal Tributary of Sims Bayou 1007N	Unnamed Non-Tidal Trib. of Buffalo Bayou 1007O	Brays Bayou Above Tidal 1007P	Sims Bayou Above Tidal 1007Q	Hunting Bayou Above Tidal 1007R	Spring Creek 1008	Upper Panther Branch 1008B	Lower Panther Branch 1008C	Bear Branch 1008E	Lake Woodlands 1008F	Upper Panther Branch above Bear Branch 1008G
DESIGNATED USE SUPPORT												
Contact Recreation Use	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	FS	NA	FS	NA	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	X	FS	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	**NS**	FS	**PS**	**NS**	FS	FS	FS	FS	NA	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	X	X	X	X	FS	X	X	X	X	X
pH	X	X	X	X	X	X	FS	X	X	X	X	X
Chloride	X	X	X	X	X	X	FS	X	X	X	X	X
Sulfate	X	X	X	X	X	X	FS	X	X	X	X	X
Total Dissolved Solids	X	X	X	X	X	X	FS	X	X	X	X	X

Trinity River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Cypress Creek 1009	Caney Creek 1010	Peach Creek 1011	Lake Conroe 1012	Buffalo Bayou Tidal 1013	Little White Oak Bayou 1013A	Unmd. Non-Tidal Trib. of Buffalo Bayou Tidal 1013C	Buffalo Bayou Above Tidal 1014	South Mayde Creek 1014H	Turkey Creek 1014K	Neimans Bayou 1014M	Rummel Creek 1014N
DESIGNATED USE SUPPORT												
Contact Recreation Use	**NS**	FS	FS	NA	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	FS	FS	FS	X	X	X	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	**PS**	FS	FS	FS	FS	**NS**	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	FS	FS	FS	FS	X	X	FS	X	X	X	X
pH	FS	FS	FS	FS	FS	X	X	FS	X	X	X	X
Chloride	FS	FS	FS	FS	X	X	X	FS	X	X	X	X
Sulfate	FS	FS	FS	FS	X	X	X	FS	X	X	X	X
Total Dissolved Solids	FS	FS	FS	FS	X	X	X	FS	X	X	X	X

Trinity River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Spring Branch 1014O	Lake Creek 1015	Greens Bayou Above Tidal 1016	Garners Bayou 1016A	Unnamed Tributary of Greens Bayou 1016B	Unnamed Tributary of Greens Bayou 1016C	Unnamed Tributary of Greens Bayou 1016D	Whiteoak Bayou Above Tidal 1017	Brickhouse Gully / Bayou 1017A	Cole Creek 1017B	Unnamed Tributary of White Oak Bayou 1017D	Unnamed Tributary of White Oak Bayou 1017E
DESIGNATED USE SUPPORT												
Contact Recreation Use	**NS**	NA	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	FS	X	X	X	X	X	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	**PS**	FS	FS	FS	**NS**	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	NA	FS	X	X	X	X	FS	X	X	X	X
pH	X	NA	FS	X	X	X	X	FS	X	X	X	X
Chloride	X	NA	FS	X	X	X	X	FS	X	X	X	X
Sulfate	X	NA	FS	X	X	X	X	FS	X	X	X	X
Total Dissolved Solids	X	NA	FS	X	X	X	X	FS	X	X	X	X

San Jacinto River Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	San Jacinto River Tidal 1001	Lake Houston 1002	Luce Bayou 1002B	East Fork San Jacinto River 1003	West Fork San Jacinto River 1004	Houston Ship Ch./San Jacinto River Tidal 1005	Houston Ship Channel Tidal 1006	Halls Bayou Below US 59 1006D	Halls Bayou Above US 59 1006E	Big Gulch Above Tidal 1006F	Spring Gully Above Tidal 1006H	Unnamed Tributary of Halls Bayou 1006I
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	**C**	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	**C**	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NC	NC	NC	**C**	**C**	**C**	**C**	**C**	**C**
Nitrite + Nitrate Nitrogen	NC	**C**	NC	NC	**C**	NC	**C**	NA	NA	NA	NA	NA
Orthophosphorus	NC	**C**	NC	NC	**C**	NC	NC	NA	NA	NA	NA	NA
Total Phosphorus	NC	**C**	NC	NC	NC	NC	NC	NA	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NC	NC	NA	NC	NC	NC	NC	NA	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	NC	X	NC	NC	X	X	X	X	X	X	X
Finished Water: Sulfate	X	NC	X	NC	NC	X	X	X	X	X	X	X
Finished Water: TDS	X	NC	X	NC	NC	X	X	X	X	X	X	X
Surface Water: Chloride	X	NC	X	NC	NC	X	X	X	X	X	X	X
Surface Water: Sulfate	X	NC	X	NC	NC	X	X	X	X	X	X	X
Surface Water: TDS	X	NC	X	NC	NC	X	X	X	X	X	X	X

San Jacinto River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Unnamed Tributary of Halls Bayou 1006J	Houston Ship Ch./Buffalo Bayou Tidal 1007	Brays Bayou Above Tidal 1007B	Keegans Bayou Above Tidal 1007C	Sims Bayou Above Tidal 1007D	Willow Waterhole Bayou Above Tidal 1007E	Berry Bayou Above Tidal 1007F	Kuhlman Gully Above Tidal 1007G	Pine Gully Above Tidal 1007H	Plum Creek Above Tidal 1007I	Country Club Bayou Above Tidal 1007K	Unnamed Non-Tidal Trib. of Brays Bayou 1007L
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	**C**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	**C**	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	**C**	**C**	**C**	**C**	**C**	NC	**C**	**C**	**C**	**C**	**C**	NC
Nitrite + Nitrate Nitrogen	NA	**C**	**C**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Orthophosphorus	NA	**C**	**C**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus	NA	**C**	**C**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	X	X	X	X	X	X	X	X	X	X
Finished Water: Sulfate	X	X	X	X	X	X	X	X	X	X	X	X
Finished Water: TDS	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: Chloride	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: Sulfate	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: TDS	X	X	X	X	X	X	X	X	X	X	X	X

San Jacinto River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Unnamed Non-Tidal Trib. of Hunting Bayou 1007M	Unnamed Non-Tidal Tributary of Sims Bayou 1007N	Unnamed Non-Tidal Trib. of Buffalo Bayou 1007O	Brays Bayou Above Tidal 1007P	Sims Bayou Above Tidal 1007Q	Hunting Bayou Above Tidal 1007R	Spring Creek 1008	Upper Panther Branch 1008B	Lower Panther Branch 1008C	Bear Branch 1008E	Lake Woodlands 1008F	Upper Panther Branch above Bear Branch 1008G
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	**C**	**C**	**C**	**C**	**C**	NC	**C**	NC	NC	NA	**C**
Nitrite + Nitrate Nitrogen	NA	NA	NA	NA	**C**	NA	**C**	NA	NA	NA	NA	NA
Orthophosphorus	NA	NA	NA	NA	**C**	NA	**C**	NA	NA	NA	NA	NA
Total Phosphorus	NA	NA	NA	NA	**C**	NA	**C**	**C**	NA	NC	NA	NC
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NA	NC	NA	NC	NA	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	X	X	X	X	NC	X	X	X	X	X
Finished Water: Sulfate	X	X	X	X	X	X	NC	X	X	X	X	X
Finished Water: TDS	X	X	X	X	X	X	NC	X	X	X	X	X
Surface Water: Chloride	X	X	X	X	X	X	NC	X	X	X	X	X
Surface Water: Sulfate	X	X	X	X	X	X	NC	X	X	X	X	X
Surface Water: TDS	X	X	X	X	X	X	NC	X	X	X	X	X

San Jacinto River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Cypress Creek 1009	Caney Creek 1010	Peach Creek 1011	Lake Conroe 1012	Buffalo Bayou Tidal 1013	Little White Oak Bayou 1013A	Unmd. Non-Tidal Trib. of Buffalo Bayou Tidal 1013C	Buffalo Bayou Above Tidal 1014	South Mayde Creek 1014H	Turkey Creek 1014K	Neimans Bayou 1014M	Rummel Creek 1014N
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	**C**	NC	NC	NC	NC	**C**	**C**	**C**	NC	NC	**C**	**C**
Nitrite + Nitrate Nitrogen	**C**	NC	NC	NC	**C**	NA	NA	**C**	NA	NA	NA	NA
Orthophosphorus	**C**	NC	NC	NC	**C**	NA	NA	**C**	NA	NA	NA	NA
Total Phosphorus	**C**	NC	NC	NC	**C**	NA	NA	**C**	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NC	NC	NC	NA	NC	NA	NA	NC	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	NC	NC	NC	NC	X	X	X	X	X	X	X	X
Finished Water: Sulfate	NC	NC	NC	NC	X	X	X	X	X	X	X	X
Finished Water: TDS	NC	NC	NC	NC	X	X	X	X	X	X	X	X
Surface Water: Chloride	NC	NC	NC	NC	X	X	X	X	X	X	X	X
Surface Water: Sulfate	NC	NC	NC	NC	X	X	X	X	X	X	X	X
Surface Water: TDS	NC	NC	NC	NC	X	X	X	X	X	X	X	X

San Jacinto River Basin Tabular Summary of Water Quality Concerns (continued)

	1014O Spring Branch	1015 Lake Creek	1016 Greens Bayou Above Tidal	1016A Garners Bayou	1016B Unnamed Tributary of Greens Bayou	1016C Unnamed Tributary of Greens Bayou	1016D Unnamed Tributary of Greens Bayou	1017 Whiteoak Bayou Above Tidal	1017A Brickhouse Gully / Bayou	1017B Cole Creek	1017D Unnamed Tributary of White Oak Bayou	1017E Unnamed Tributary of White Oak Bayou
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NA	**C**	**C**	NC	**C**	**C**	**C**	**C**	**C**	**C**	NC
Nitrite + Nitrate Nitrogen	NA	NA	**C**	NA	NA	NA	NA	**C**	NA	NA	NA	NA
Orthophosphorus	NA	NA	**C**	NA	NA	NA	NA	**C**	NA	NA	NA	NA
Total Phosphorus	NA	NA	**C**	NA	NA	NA	NA	**C**	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NC	NA	NA	NA	NA	NC	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	NC	X	X	X	X	X	X	X	X	X	X
Finished Water: Sulfate	X	NC	X	X	X	X	X	X	X	X	X	X
Finished Water: TDS	X	NC	X	X	X	X	X	X	X	X	X	X
Surface Water: Chloride	X	NA	X	X	X	X	X	X	X	X	X	X
Surface Water: Sulfate	X	NA	X	X	X	X	X	X	X	X	X	X
Surface Water: TDS	X	NA	X	X	X	X	X	X	X	X	X	X

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

San Jacinto-Brazos Coastal Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	1101 Clear Creek Tidal	1101B Chigger Creek	1102 Clear Creek Above Tidal	1102A Cowart Creek	1102B Mary's Creek/ North Fork Mary's Creek	1103 Dickinson Bayou Tidal	1103A Bensons Bayou	1103B Bordens Gully	1103C Geisler Bayou	1103D Gum Bayou	1104 Dickinson Bayou Above Tidal	1105 Bastrop Bayou Tidal
DESIGNATED USE SUPPORT												
Contact Recreation Use	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	X	X	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	**NS**	FS	FS	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	**PS**	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	**NS**	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	FS	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	X	FS	X	X	FS	X	X	X	X	FS	FS
pH	FS	X	FS	X	X	FS	X	X	X	X	FS	FS
Chloride	X	X	**NS**	X	X	X	X	X	X	X	FS	X
Sulfate	X	X	FS	X	X	X	X	X	X	X	FS	X
Total Dissolved Solids	X	X	**NS**	X	X	X	X	X	X	X	FS	X

San Jacinto-Brazos Coastal Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Chocolate Bayou Tidal 1107	Chocolate Bayou Above Tidal 1108	Oyster Creek Tidal 1109	Oyster Creek Above Tidal 1110	Old Brazos River Channel Tidal 1111	Armand Bayou Tidal 1113	Armand Bayou Above Tidal 1113A
DESIGNATED USE SUPPORT							
Contact Recreation Use	FS	FS	FS	FS	FS	FS	NA
Noncontact Recreation Use	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	FS	X	X	X
Aquatic Life Use							
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	FS	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use							
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT							
Water Temperature	FS	FS	FS	FS	FS	FS	X
pH	FS	FS	FS	FS	FS	FS	X
Chloride	X	FS	X	FS	X	X	X
Sulfate	X	FS	X	FS	X	X	X
Total Dissolved Solids	X	FS	X	FS	X	X	X

San Jacinto-Brazos Coastal Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	1101 Clear Creek Tidal	1101B Chigger Creek	1102 Clear Creek Above Tidal	1102A Cowart Creek	1102B Mary's Creek/ North Fork Mary's Creek	1103 Dickinson Bayou Tidal	1103A Bensons Bayou	1103B Bordens Gully	1103C Geisler Bayou	1103D Gum Bayou	1104 Dickinson Bayou Above Tidal	1105 Bastrop Bayou Tidal
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	**C**	**C**	**C**	**C**	NC	NC	NC	NC	NC	**C**	NC
Nitrite + Nitrate Nitrogen	NC	NC	**C**	NC	NC	NC	NC	NC	NC	NC	NC	NC
Orthophosphorus	NC	NA	**C**	NA	NA	NC	NA	NA	NA	NA	NC	NC
Total Phosphorus	NC	NA	**C**	NA	NA	NC	NA	NA	NA	NA	NC	NC
Algal Growth												
Chlorophyll *a*	NC	NA	NC	NA	NA	NC	NA	NA	NA	NA	NC	NC
Public Water Supply												
Finished Water: Chloride	X	X	X	X	X	X	X	X	X	X	X	X
Finished Water: Sulfate	X	X	X	X	X	X	X	X	X	X	X	X
Finished Water: TDS	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: Chloride	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: Sulfate	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: TDS	X	X	X	X	X	X	X	X	X	X	X	X

San Jacinto-Brazos Coastal Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Chocolate Bayou Tidal 1107	Chocolate Bayou Above Tidal 1108	Oyster Creek Tidal 1109	Oyster Creek Above Tidal 1110	Old Brazos River Channel Tidal 1111	Armand Bayou Tidal 1113	Armand Bayou Above Tidal 1113A
WATER QUALITY CONCERNS							
Sediment Contaminants	NA	NA	NA	NA	**C**	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NC	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment							
Ammonia Nitrogen	NC	NC	NC	NC	NC	NC	NA
Nitrite + Nitrate Nitrogen	NC	NC	NC	NC	NC	NC	NA
Orthophosphorus	NC	NC	NC	NC	NC	NC	NA
Total Phosphorus	NC	NC	NC	NC	NC	NC	NA
Algal Growth							
Chlorophyll *a*	NC	NC	NC	NC	NC	**C**	NA
Public Water Supply							
Finished Water: Chloride	X	X	X	NC	X	X	X
Finished Water: Sulfate	X	X	X	NC	X	X	X
Finished Water: TDS	X	X	X	NC	X	X	X
Surface Water: Chloride	X	X	X	NC	X	X	X
Surface Water: Sulfate	X	X	X	NC	X	X	X
Surface Water: TDS	X	X	X	NC	X	X	X

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

Brazos River Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Brazos River Tidal 1201	Brazos River Below Navasota River 1202	Allen's Creek 1202H	Bessie's Creek 1202I	Big Creek 1202J	Mill Creek 1202K	Whitney Lake 1203	Steele Creek 1203A	Brazos River Below Lake Granbury 1204	Lake Granbury 1205	Brazos River Below Possum Kingdom Lake 1206	Palo Pinto Creek below Palo Pinto Reservoir 1206D
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	**NS**	NA	**NS**	FS	FS	NA	FS	FS	FS	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	FS	X	X	X	X	FS	X	X	FS	X	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	NA	FS	FS	FS	NA	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	FS	X	X	X	X	FS	X	FS	FS	FS	X
pH	FS	FS	X	X	X	X	FS	X	FS	FS	FS	X
Chloride	X	FS	X	X	X	X	FS	X	FS	FS	FS	X
Sulfate	X	FS	X	X	X	X	FS	X	FS	FS	FS	X
Total Dissolved Solids	X	FS	X	X	X	X	FS	X	FS	FS	FS	X

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Possum Kingdom Lake 1207	Brazos River Above Possum Kingdom Lake 1208	Navasota River Below Lake Limestone 1209	Country Club Lake 1209A	Fin Feather Lake 1209B	Carters Creek 1209C	Country Club Branch 1209D	Cedar Creek 1209G	Duck Creek 1209H	Gibbons Creek 1209I	Shepherd Creek 1209J	Steele Creek 1209K
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	**NS**	NA	NA	**NS**	NA	**NS**	FS	**NS**	**NS**	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	X	FS	X	X	X	X	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	NA	NA	FS	NA	FS	FS	**NS**	NA	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	FS	FS	X	X	X	X	X	X	X	X	X
pH	FS	FS	FS	X	X	X	X	X	X	X	X	X
Chloride	FS	FS	FS	X	X	X	X	X	X	X	X	X
Sulfate	FS	FS	FS	X	X	X	X	X	X	X	X	X
Total Dissolved Solids	FS	FS	FS	X	X	X	X	X	X	X	X	X

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Lake Mexia 1210	Navasota River above Lake Mexia 1210A	Yegua Creek 1211	Davidson Creek 1211A	Somerville Lake 1212	Middle Yegua Creek 1212A	East Yegua Creek 1212B	Little River 1213	San Gabriel River 1214	Lampasas River Below Stillhouse Hollow Lake 1215	Stillhouse Hollow Lake 1216	Lampasas River Above Stillhouse Hollow Lake 1217
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	**NS**	FS	**NS**	FS	FS	**NS**	FS	FS	FS	FS	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	X	FS	X	FS	X	X	FS	FS	FS	FS	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	X	FS	X	FS	X	X	FS	FS	FS	FS	FS
pH	FS	X	FS	X	**PS**	X	X	FS	FS	FS	FS	FS
Chloride	FS	X	FS	X	FS	X	X	FS	FS	FS	FS	FS
Sulfate	FS	X	FS	X	FS	X	X	FS	FS	FS	FS	FS
Total Dissolved Solids	FS	X	FS	X	FS	X	X	FS	FS	FS	FS	FS

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Rocky Creek 1217A	Sulphur Creek 1217B	Simms Creek 1217C	Nolan Creek/ South Nolan Creek 1218	Leon River Below Belton Lake 1219	Belton Lake 1220	Cowhouse Creek 1220A	Leon River Below Proctor Lake 1221	Resley Creek 1221A	South Leon River 1221B	Proctor Lake 1222	Duncan Creek 1222A
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	FS	**NS**	NA	FS	FS	**NS**	NA	FS	FS	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	FS	FS	X	FS	X	X	FS	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	FS	NA	FS	FS	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	X	FS	FS	FS	X	FS	X	X	FS	X
pH	X	X	X	FS	FS	FS	X	FS	X	X	FS	X
Chloride	X	X	X	FS	FS	FS	X	FS	X	X	FS	X
Sulfate	X	X	X	FS	FS	FS	X	FS	X	X	FS	X
Total Dissolved Solids	X	X	X	FS	FS	FS	X	FS	X	X	FS	X

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Rush-Copperas Creek 1222B	Sabana River 1222C	Leon River Below Leon Reservoir 1223	Leon Reservoir 1224	Waco Lake 1225	Hog Creek 1225A	North Bosque River 1226	Duffau Creek 1226A	Green Creek 1226B	Meridian Creek 1226C	Neils Creek 1226D	Indian Creek 1226E
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	FS	NA	FS	FS	FS	FS	**NS**	FS	FS	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	FS	FS	FS	X	FS	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	NA	FS	NA	FS	FS	FS	FS	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	FS	NA	FS	X	FS	X	X	X	X	X
pH	X	X	FS	NA	FS	X	FS	X	X	X	X	X
Chloride	X	X	FS	FS	FS	X	FS	X	X	X	X	X
Sulfate	X	X	FS	FS	FS	X	FS	X	X	X	X	X
Total Dissolved Solids	X	X	FS	FS	FS	X	FS	X	X	X	X	X

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Sims Creek 1226F	Spring Creek 1226G	Nolan River 1227	Lake Pat Cleburne 1228	Paluxy River /North Paluxy River 1229	Lake Palo Pinto 1230	Lake Graham 1231	Clear Fork Brazos River 1232	California Creek 1232A	Deadman Creek 1232B	Hubbard Creek Reservoir 1233	Lake Cisco 1234
DESIGNATED USE SUPPORT												
Contact Recreation Use	**NS**	FS	**NS**	NA	FS	NA	NA	FS	FS	FS	NA	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	FS	FS	FS	FS	X	X	X	FS	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	NA	FS	NA	NA	FS	FS	FS	FS	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	FS	NA	FS	NA	NA	FS	X	X	FS	NA
pH	X	X	FS	NA	FS	NA	NA	FS	X	X	FS	NA
Chloride	X	X	FS	NA	FS	NA	NA	FS	X	X	FS	NA
Sulfate	X	X	**NS**	NA	FS	NA	NA	FS	X	X	FS	NA
Total Dissolved Solids	X	X	FS	NA	FS	NA	NA	FS	X	X	FS	NA

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Lake Stamford 1235	Fort Phantom Hill Reservoir 1236	Lake Sweetwater 1237	Salt Fork Brazos River 1238	White River 1239	White River Lake 1240	White River above White River Reservoir 1240A	Double Mountain Fork Brazos River 1241	N. Fork Double Mtn. Fork Brazos River 1241A	Brazos River Above Navasota River 1242	Marlin City Lake System 1242A	Thompson Creek 1242D
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	NA	NA	FS	NA	FS	NA	FS	FS	**NS**	NA	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	FS	FS	X	FS	FS	X	X	X	FS	FS	X
Aquatic Life Use												
Dissolved Oxygen grab min	NA	NA	NA	FS	NA	FS	NA	FS	FS	FS	NA	**PS**
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	NA	NA	NA	FS	X	FS	X	FS	X	FS	X	X
pH	NA	NA	NA	FS	X	FS	X	FS	X	FS	X	X
Chloride	NA	NA	NA	**NS**	X	**NS**	X	FS	X	FS	X	X
Sulfate	NA	NA	NA	FS	X	FS	X	FS	X	FS	X	X
Total Dissolved Solids	NA	NA	NA	**NS**	X	FS	X	FS	X	FS	X	X

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Little Brazos River 1242E	Pond Creek 1242F	Campbells Creek 1242I	Deer Creek 1242J	Mud Creek 1242K	Pin Oak Creek 1242L	Spring Creek 1242M	Tehuacana Creek 1242N	Walnut Creek 1242O	Big Creek 1242P	Salado Creek 1243	Brushy Creek 1244
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	**NS**	FS	**NS**	**NS**	**NS**	**NS**	FS	**NS**	FS	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	X	X	X	X	X	FS	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	X	X	X	X	X	X	X	X	FS	FS
pH	X	X	X	X	X	X	X	X	X	X	FS	FS
Chloride	X	X	X	X	X	X	X	X	X	X	FS	FS
Sulfate	X	X	X	X	X	X	X	X	X	X	FS	FS
Total Dissolved Solids	X	X	X	X	X	X	X	X	X	X	FS	FS

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Brushy Creek Above South Brushy Creek 1244A	Upper Oyster Creek 1245	Middle Bosque/South Bosque River 1246	Tonk Creek 1246D	Wasp Creek 1246E	Granger Lake 1247	Willis Creek 1247A	San Gabriel/North Fork San Gabriel River 1248	Berry Creek 1248A	Huddleston Branch 1248B	Mankins Branch 1248C	Lake Georgetown 1249
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	**NS**	FS	FS	**NS**	FS	**NS**	FS	FS	NA	NA	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	FS	X	X	X	FS	X	FS	X	X	X	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	FS	NA	NA	NA	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	FS	FS	X	X	FS	X	FS	X	X	X	FS
pH	X	FS	FS	X	X	FS	X	FS	X	X	X	FS
Chloride	X	FS	FS	X	X	FS	X	FS	X	X	X	FS
Sulfate	X	FS	FS	X	X	FS	X	FS	X	X	X	FS
Total Dissolved Solids	X	FS	FS	X	X	FS	X	**NS**	X	X	X	FS

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	South Fork San Gabriel River 1250	North Fork San Gabriel River 1251	Lake Limestone 1252	Navasota River Below Lake Mexia 1253	Aquilla Reservoir 1254	Upper North Bosque River 1255	Goose Branch 1255A	North Fork Upper North Bosque River 1255B	Scarborough Creek 1255C	South Fork North Bosque River 1255D	Unnamed tributary of Goose Branch 1255E	Unnamed tributary of Scarborough Creek 1255F
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	NA	FS	FS	FS	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	FS	FS	FS	FS	X	X	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	FS	FS	FS	FS	FS	X	X	X	X	X	X
pH	FS	FS	FS	FS	FS	FS	X	X	X	X	X	X
Chloride	FS	FS	FS	FS	FS	FS	X	X	X	X	X	X
Sulfate	FS	FS	FS	FS	FS	FS	X	X	X	X	X	X
Total Dissolved Solids	FS	FS	FS	FS	FS	FS	X	X	X	X	X	X

Brazos River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Woodhollow Branch 1255G	Brazos River/Lake Brazos 1256	Aquilla Creek 1256A	Brazos River Below Lake Whitney 1257
DESIGNATED USE SUPPORT				
Contact Recreation Use	**NS**	FS	FS	FS
Noncontact Recreation Use	X	X	X	X
Public Water Supply Use	X	FS	X	FS
Aquatic Life Use				
Dissolved Oxygen grab min	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA
Habitat	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA
Fish Consumption Use				
Advisories and Closures	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA
GENERAL USE SUPPORT				
Water Temperature	X	FS	X	FS
pH	X	FS	X	FS
Chloride	X	FS	X	FS
Sulfate	X	FS	X	FS
Total Dissolved Solids	X	FS	X	FS

Brazos River Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Brazos River Tidal 1201	Brazos River Below Navasota River 1202	Allen's Creek 1202H	Bessie's Creek 1202I	Big Creek 1202J	Mill Creek 1202K	Whitney Lake 1203	Steele Creek 1203A	Brazos River Below Lake Granbury 1204	Lake Granbury 1205	Brazos River Below Possum Kingdom Lake 1206	Palo Pinto Creek below Palo Pinto Reservoir 1206D
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NA	NA	NA	NC	NA	NA	NC	NA	NC	NA
Nitrite + Nitrate Nitrogen	NC	NC	NC	NA	NC	NC	**C**	NA	NC	NC	NC	NC
Orthophosphorus	NC	NC	**C**	NA	NC	NC	NC	NA	NC	NC	NC	NC
Total Phosphorus	NC	NC	NA	NA	NA	NC	NA	NA	NA	NA	NC	NA
Algal Growth												
Chlorophyll *a*	NC	**C**	NA	NA	NA	NC	NA	NA	NA	NA	NC	NA
Public Water Supply												
Finished Water: Chloride	NC	NC	X	X	X	X	NC	X	X	NC	X	NC
Finished Water: Sulfate	NC	NC	X	X	X	X	NC	X	X	NC	X	NC
Finished Water: TDS	NC	NC	X	X	X	X	NC	X	X	NC	X	NC
Surface Water: Chloride	NA	NC	X	X	X	X	**C**	X	X	**C**	X	NC
Surface Water: Sulfate	NA	NC	X	X	X	X	NC	X	X	NC	X	**C**
Surface Water: TDS	NA	NC	X	X	X	X	NC	X	X	**C**	X	NC

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	1207 Possum Kingdom Lake	1208 Brazos River Above Possum Kingdom Lake	1209 Navasota River Below Lake Limestone	1209A Country Club Lake	1209B Fin Feather Lake	1209C Carters Creek	1209D Country Club Branch	1209G Cedar Creek	1209H Duck Creek	1209I Gibbons Creek	1209J Shepherd Creek	1209K Steele Creek
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	**C**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	**C**	**C**	NC	**C**	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite + Nitrate Nitrogen	NC	NC	NC	NA	NA	**C**	NA	NC	NC	NC	NC	NC
Orthophosphorus	NC	NC	NC	NA	NA	**C**	NA	NC	NC	NC	NC	NC
Total Phosphorus	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NA	**C**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	**C**	X	NC	X	X	X	X	X	X	X	X	X
Finished Water: Sulfate	**C**	X	NC	X	X	X	X	X	X	X	X	X
Finished Water: TDS	**C**	X	NC	X	X	X	X	X	X	X	X	X
Surface Water: Chloride	**C**	X	NC	X	X	X	X	X	X	X	X	X
Surface Water: Sulfate	**C**	X	NC	X	X	X	X	X	X	X	X	X
Surface Water: TDS	**C**	X	NC	X	X	X	X	X	X	X	X	X

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Lake Mexia 1210	Navasota River above Lake Mexia 1210A	Yegua Creek 1211	Davidson Creek 1211A	Somerville Lake 1212	Middle Yegua Creek 1212A	East Yegua Creek 1212B	Little River 1213	San Gabriel River 1214	Lampasas River Below Stillhouse Hollow Lake 1215	Stillhouse Hollow Lake 1216	Lampasas River Above Stillhouse Hollow Lake 1217
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NA	NA	NA	NA	NA	NA	NA	NC	NC	NC	NA
Nitrite + Nitrate Nitrogen	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Orthophosphorus	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total Phosphorus	**C**	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NC	NA	NA	NA	NA	NA	NA	NA	NC	NC	NA	NA
Public Water Supply												
Finished Water: Chloride	NC	X	NC	X	NC	X	X	NC	NC	NC	NC	X
Finished Water: Sulfate	NC	X	NC	X	NC	X	X	NC	NC	NC	NC	X
Finished Water: TDS	NC	X	NC	X	NC	X	X	NC	NC	NC	NC	X
Surface Water: Chloride	NC	X	NC	X	NC	X	X	NC	NC	NC	NC	X
Surface Water: Sulfate	NC	X	NC	X	NC	X	X	NC	NC	NC	NC	X
Surface Water: TDS	NC	X	NC	X	NC	X	X	NC	NC	NC	NC	X

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	1217A Rocky Creek	1217B Sulphur Creek	1217C Simms Creek	1218 Nolan Creek/ South Nolan Creek	1219 Leon River Below Belton Lake	1220 Belton Lake	1220A Cowhouse Creek	1221 Leon River Below Proctor Lake	1221A Resley Creek	1221B South Leon River	1222 Proctor Lake	1222A Duncan Creek
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	**C**	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NA	NA	NC	NC	NC	NC	NC	NA	NC	NC	NA
Nitrite + Nitrate Nitrogen	NC	NC	NC	**C**	NC	**C**	NC	NC	NA	NC	NC	NA
Orthophosphorus	NC	NC	NC	**C**	NC	NC	NC	NC	NA	NC	NC	NA
Total Phosphorus	NA	NA	NA	**C**	NA	NC	NA	NC	NA	NC	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NC	NA	NC	NA	**C**	NA	NC	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	X	X	NC	NC	X	NC	X	X	NC	X
Finished Water: Sulfate	X	X	X	X	NC	NC	X	NC	X	X	NC	X
Finished Water: TDS	X	X	X	X	NC	NC	X	NC	X	X	NC	X
Surface Water: Chloride	X	X	X	X	NC	NC	X	NC	X	X	NC	X
Surface Water: Sulfate	X	X	X	X	NC	NC	X	NC	X	X	NC	X
Surface Water: TDS	X	X	X	X	NC	NC	X	NC	X	X	NC	X

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Rush-Copperas Creek 1222B	Sabana River 1222C	Leon River Below Leon Reservoir 1223	Leon Reservoir 1224	Waco Lake 1225	Hog Creek 1225A	North Bosque River 1226	Duffau Creek 1226A	Green Creek 1226B	Meridian Creek 1226C	Neils Creek 1226D	Indian Creek 1226E
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitrite + Nitrate Nitrogen	NC	NC	NC	NC	**C**	NC	NC	NC	NC	NC	NC	**C**
Orthophosphorus	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total Phosphorus	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Algal Growth												
Chlorophyll *a*	NA	NC	NC	NC	**C**	NC	**C**	NC	**C**	NC	NC	NA
Public Water Supply												
Finished Water: Chloride	X	X	NC	NC	NC	X	NC	X	X	X	X	X
Finished Water: Sulfate	X	X	NC	NC	NC	X	NC	X	X	X	X	X
Finished Water: TDS	X	X	NC	NC	NC	X	NC	X	X	X	X	X
Surface Water: Chloride	X	X	NC	NC	NC	X	NC	X	X	X	X	X
Surface Water: Sulfate	X	X	NC	NC	NC	X	NC	X	X	X	X	X
Surface Water: TDS	X	X	NC	NC	NC	X	NC	X	X	X	X	X

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Sims Creek 1226F	Spring Creek 1226G	Nolan River 1227	Lake Pat Cleburne 1228	Paluxy River /North Paluxy River 1229	Lake Palo Pinto 1230	Lake Graham 1231	Clear Fork Brazos River 1232	California Creek 1232A	Deadman Creek 1232B	Hubbard Creek Reservoir 1233	Lake Cisco 1234
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NA	NC	NA	NA	NC	NA	NC	NC	NA
Nitrite + Nitrate Nitrogen	NC	NC	**C**	NA	NC	NA	NA	**C**	**C**	**C**	NC	NA
Orthophosphorus	NC	NC	**C**	NA	NC	NA	NA	**C**	NC	**C**	NC	NA
Total Phosphorus	NC	NC	NC	NA	NC	NA	NA	NC	NA	**C**	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NC	NA	NC	NA	NA	NC	NA	NC	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	X	NC	NC	NC	NC	X	X	X	NC	NC
Finished Water: Sulfate	X	X	X	NC	NC	NC	NC	X	X	X	NC	NC
Finished Water: TDS	X	X	X	NC	NC	NC	NC	X	X	X	NC	NC
Surface Water: Chloride	X	X	X	NA	NC	NA	NA	X	X	X	NC	NA
Surface Water: Sulfate	X	X	X	NA	NC	NA	NA	X	X	X	NC	NA
Surface Water: TDS	X	X	X	NA	NC	NA	NA	X	X	X	NC	NA

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	1235 Lake Stamford	1236 Fort Phantom Hill Reservoir	1237 Lake Sweetwater	1238 Salt Fork Brazos River	1239 White River	1240 White River Lake	1240A White River above White River Reservoir	1241 Double Mountain Fork Brazos River	1241A N. Fork Double Mtn. Fork Brazos River	1242 Brazos River Above Navasota River	1242A Marlin City Lake System	1242D Thompson Creek
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NA	NA	**C**	NA	NA	NA	NC	NC	NC	NA	NA
Nitrite + Nitrate Nitrogen	NA	NA	NA	NC	NA	NC	NA	NC	**C**	NC	NA	**C**
Orthophosphorus	NA	NA	NA	NC	NA	NC	NA	NC	NA	NC	NA	**C**
Total Phosphorus	NA	NA	NA	NC	NA	NA	NA	NC	NC	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NC	NA	NA	NA	NC	**C**	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	**C**	NC	NC	X	NC	NC	X	X	X	NC	NC	X
Finished Water: Sulfate	**C**	NC	**C**	X	NC	NC	X	X	X	NC	NC	X
Finished Water: TDS	**C**	NC	NC	X	NC	NC	X	X	X	NC	NC	X
Surface Water: Chloride	NA	NA	NA	X	NA	NC	X	X	X	NC	NC	X
Surface Water: Sulfate	NA	NA	NA	X	NA	NC	X	X	X	NC	NC	X
Surface Water: TDS	NA	NA	NA	X	NA	NC	X	X	X	NC	NC	X

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Little Brazos River 1242E	Pond Creek 1242F	Campbells Creek 1242I	Deer Creek 1242J	Mud Creek 1242K	Pin Oak Creek 1242L	Spring Creek 1242M	Tehuacana Creek 1242N	Walnut Creek 1242O	Big Creek 1242P	Salado Creek 1243	Brushy Creek 1244
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite + Nitrate Nitrogen	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	**C**	**C**
Orthophosphorus	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	**C**
Total Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	X	X	X	X	X	X	X	X	NC	NC
Finished Water: Sulfate	X	X	X	X	X	X	X	X	X	X	NC	NC
Finished Water: TDS	X	X	X	X	X	X	X	X	X	X	NC	NC
Surface Water: Chloride	X	X	X	X	X	X	X	X	X	X	NC	NC
Surface Water: Sulfate	X	X	X	X	X	X	X	X	X	X	NC	NC
Surface Water: TDS	X	X	X	X	X	X	X	X	X	X	NC	NC

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Brushy Creek Above South Brushy Creek 1244A	Upper Oyster Creek 1245	Middle Bosque/South Bosque River 1246	Tonk Creek 1246D	Wasp Creek 1246E	Granger Lake 1247	Willis Creek 1247A	San Gabriel/North Fork San Gabriel River 1248	Berry Creek 1248A	Huddleston Branch 1248B	Mankins Branch 1248C	Lake Georgetown 1249
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	**C**	NC	NC	NC	NC	NC	NC	NC	NC	NC	**C**	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NC	NC	NC	NC	NC	NA	NC	NC	NA	NA	NC
Nitrite + Nitrate Nitrogen	NC	NC	**C**	**C**	**C**	**C**	**C**	NC	NC	NA	NA	NC
Orthophosphorus	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NC
Total Phosphorus	NA	NC	NC	NC	NC	NC	NA	NC	NC	NA	NA	NC
Algal Growth												
Chlorophyll *a*	NA	NC	NC	NC	NC	NC	NA	NC	NC	NA	NA	NC
Public Water Supply												
Finished Water: Chloride	X	NC	X	X	X	NC	X	NC	X	X	X	NC
Finished Water: Sulfate	X	NC	X	X	X	NC	X	NC	X	X	X	NC
Finished Water: TDS	X	NC	X	X	X	NC	X	NC	X	X	X	NC
Surface Water: Chloride	X	NC	X	X	X	NC	X	NC	X	X	X	NC
Surface Water: Sulfate	X	NC	X	X	X	NC	X	NC	X	X	X	NC
Surface Water: TDS	X	NC	X	X	X	NC	X	NC	X	X	X	NC

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	South Fork San Gabriel River 1250	North Fork San Gabriel River 1251	Lake Limestone 1252	Navasota River Below Lake Mexia 1253	Aquilla Reservoir 1254	Upper North Bosque River 1255	Goose Branch 1255A	North Fork Upper North Bosque River 1255B	Scarborough Creek 1255C	South Fork North Bosque River 1255D	Unnamed tributary of Goose Branch 1255E	Unnamed tributary of Scarborough Creek 1255F
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NA	**C**	NC	**C**	**C**	**C**	**C**	**C**	**C**	NC
Nitrite + Nitrate Nitrogen	NC	NC	**C**	NC	**C**	**C**	**C**	NC	NC	NC	NC	NC
Orthophosphorus	NC	NC	NC	NC	NC	**C**	**C**	**C**	**C**	NC	**C**	NC
Total Phosphorus	NC	NC	NA	NC	NC	**C**	**C**	NC	**C**	NC	**C**	NC
Algal Growth												
Chlorophyll *a*	NC	NC	NA	**C**	NC	**C**	NA	**C**	NA	**C**	NA	NA
Public Water Supply												
Finished Water: Chloride	NC	NC	NC	NC	NC	X	X	X	X	X	X	X
Finished Water: Sulfate	NC	NC	NC	NC	NC	X	X	X	X	X	X	X
Finished Water: TDS	NC	NC	NC	NC	NC	X	X	X	X	X	X	X
Surface Water: Chloride	NC	NC	NC	NC	NC	X	X	X	X	X	X	X
Surface Water: Sulfate	NC	NC	NC	NC	NC	X	X	X	X	X	X	X
Surface Water: TDS	NC	NC	NC	NC	NC	X	X	X	X	X	X	X

Brazos River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Woodhollow Branch 1255G	Brazos River/Lake Brazos 1256	Aquilla Creek 1256A	Brazos River Below Lake Whitney 1257
WATER QUALITY CONCERNS				
Sediment Contaminants	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA
Narrative	NC	NC	NC	NC
Nutrient Enrichment				
Ammonia Nitrogen	NC	NC	NA	NA
Nitrite + Nitrate Nitrogen	NC	NC	NC	NC
Orthophosphorus	NC	NC	NC	NC
Total Phosphorus	NC	NC	NA	NA
Algal Growth				
Chlorophyll *a*	NA	NC	NA	NA
Public Water Supply				
Finished Water: Chloride	X	NC	X	NC
Finished Water: Sulfate	X	NC	X	NC
Finished Water: TDS	X	NC	X	NC
Surface Water: Chloride	X	NC	X	NC
Surface Water: Sulfate	X	NC	X	NC
Surface Water: TDS	X	NC	X	NC

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

Brazos-Colorado Coastal Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	San Bernard River Tidal 1301	San Bernard River Above Tidal 1302	Caney Creek Tidal 1304	Linnville Bayou 1304A	Caney Creek Above Tidal 1305
DESIGNATED USE SUPPORT					
Contact Recreation Use	FS	**NS**	FS	FS	**NS**
Noncontact Recreation Use	X	X	X	X	X
Public Water Supply Use	X	FS	X	X	X
Aquatic Life Use					
Dissolved Oxygen grab min	FS	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	FS	NA
Organics in water	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA
Fish Consumption Use					
Advisories and Closures	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	FS	NA
GENERAL USE SUPPORT					
Water Temperature	FS	FS	FS	X	FS
pH	FS	FS	FS	X	FS
Chloride	X	FS	X	X	FS
Sulfate	X	FS	X	X	FS
Total Dissolved Solids	X	FS	X	X	FS

Brazos-Colorado Coastal Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	San Bernard River Tidal 1301	San Bernard River Above Tidal 1302	Caney Creek Tidal 1304	Linnville Bayou 1304A	Caney Creek Above Tidal 1305
WATER QUALITY CONCERNS					
Sediment Contaminants	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA
Narrative	NC	NC	**C**	NC	**C**
Nutrient Enrichment					
Ammonia Nitrogen	NC	NC	NC	**C**	NC
Nitrite + Nitrate Nitrogen	NC	NC	NC	NC	NC
Orthophosphorus	NC	NC	NC	NC	NC
Total Phosphorus	NC	NC	NC	NC	NC
Algal Growth					
Chlorophyll *a*	NC	NC	NC	NC	NC
Public Water Supply					
Finished Water: Chloride	X	NC	X	X	X
Finished Water: Sulfate	X	NC	X	X	X
Finished Water: TDS	X	NC	X	X	X
Surface Water: Chloride	X	NC	X	X	X
Surface Water: Sulfate	X	NC	X	X	X
Surface Water: TDS	X	NC	X	X	X

Basin Tabular Summaries

For each basin, there are two documents: Tabular Summary of Use Support and Tabular Summary of Water Quality Concerns

Tabular Summary of Use Support

This series of tables provides a quick, detailed reference to water quality status within a basin. The summary identifies the indicators used to assess support of designated uses. For each indicator, support codes are used to identify the level of attainment as fully supporting (FS), partial supporting (PS), not supporting (NS), not assessed (NA), and not applicable (X). Indicators that contribute to partially supporting and not supporting uses are in bold type.

Tabular Summary of Water Quality Concerns

This series of tables provides a quick, detailed reference to water quality problems within a basin. The summary identifies the indicators used to assess water quality concerns. For each indicator, the presence of a water quality problem is identified as a concern (C), no concern (NC), threatened (TH), not assessed (NA), or not applicable (X). Indicators that contribute to concerns are in bold type.

Colorado River Basin Tabular Summary of Use Support

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Colorado River Tidal 1401	Colorado River Below La Grange 1402	Cummins Creek 1402A	Buckners Creek 1402C	Blue Creek 1402F	Fayette Reservoir 1402G	Skull Creek 1402H	Lake Austin 1403	Bull Creek 1403A	West Bull Creek 1403B	Cow Fork Bull Creek 1403C	Barrow Preserve Tributary 1403D
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	FS	NA	NA	FS	FS	FS	FS	NA	NA	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	FS	X	X	X	FS	X	FS	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	NA	FS	NA	FS	FS	FS	NA	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	**NS**	NA	NA	NA	NA	NA	**NS**	FS	FS	NA
Fish Community	NA	NA	**NS**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	FS	X	X	X	X	X	FS	X	X	X	X
pH	FS	FS	X	X	X	X	X	FS	X	X	X	X
Chloride	X	FS	X	X	X	X	X	FS	X	X	X	X
Sulfate	X	FS	X	X	X	X	X	FS	X	X	X	X
Total Dissolved Solids	X	FS	X	X	X	X	X	FS	X	X	X	X

Colorado River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Stillhouse Hollow 1403E	Unnamed Tributary to Bull Creek 1403F	Tanglewood Tributary to Bull Creek 1403G	Unnamed Tributary to Bull Creek 1403H	Unnamed Tributary to Bull Creek 1403I	Spicewood Tributary to Shoal Creek 1403J	Taylor Slough South 1403K	Unnamed Tributary to Lake Austin 1403L	Turkey Creek 1403M	Panther Hollow Creek 1403N	Cuernavaca Creek 1403O	Bee Creek 1403P
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	FS	FS	FS	**NS**	**NS**	FS	NA	NA	NA	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	X	X	X	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	FS	FS	FS	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	FS	FS	NA	NA	NA	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	X	X	X	X	X	X	X	X	X	X
pH	X	X	X	X	X	X	X	X	X	X	X	X
Chloride	X	X	X	X	X	X	X	X	X	X	X	X
Sulfate	X	X	X	X	X	X	X	X	X	X	X	X
Total Dissolved Solids	X	X	X	X	X	X	X	X	X	X	X	X

Colorado River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Bear Creek 1403Q	Unnamed tributary to Lake Austin 1403R	Lake Travis 1404	Hamilton Creek 1404A	Cow Creek 1404B	Long Hollow Creek 1404C	Marble Falls Lake 1405	Lake Lyndon B. Johnson 1406	Sandy Creek 1406A	Inks Lake 1407	Lake Buchanan 1408	Colorado River Above Lake Buchanan 1409
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	FS	FS	NA	NA	NA	FS	FS	FS	FS	FS	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	FS	X	X	X	FS	FS	X	FS	FS	FS
Aquatic Life Use												
Dissolved Oxygen grab min	NA	NA	FS	NA	NA	NA	FS	FS	FS	**PS**	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	FS
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	FS
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	FS	X	X	X	FS	FS	X	FS	FS	FS
pH	X	X	FS	X	X	X	FS	FS	X	FS	FS	FS
Chloride	X	X	FS	X	X	X	FS	FS	X	FS	FS	FS
Sulfate	X	X	FS	X	X	X	FS	FS	X	FS	FS	FS
Total Dissolved Solids	X	X	FS	X	X	X	FS	FS	X	FS	FS	FS

Colorado River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Colorado River Below O. H. Ivie Reservoir 1410	E. V. Spence Reservoir 1411	Colorado River Below Lake J. B. Thomas 1412	Lake Colorado City 1412A	Beals Creek 1412B	Deep Creek 1412C	Lake J. B. Thomas 1413	Pedernales River 1414	Cypress Creek 1414B	Live Oak Creek 1414C	Miller Creek 1414D	Llano River 1415
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	NA	NA	NA	NA	NA	NA	FS	FS	NA	NA	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	FS	X	FS	X	X	FS	FS	X	X	X	FS
Aquatic Life Use												
Dissolved Oxygen grab min	FS	NA	FS	NA	FS	FS	NA	FS	FS	NA	NA	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	NA	FS	X	X	X	NA	FS	X	X	X	FS
pH	FS	NA	FS	X	X	X	NA	FS	X	X	X	FS
Chloride	FS	NA	FS	X	X	X	NA	FS	X	X	X	FS
Sulfate	FS	NA	FS	X	X	X	NA	FS	X	X	X	FS
Total Dissolved Solids	FS	NA	FS	X	X	X	NA	FS	X	X	X	FS

Colorado River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	1415A Johnson Fork Creek	1416 San Saba River	1416A Brady Creek	1417 Lower Pecan Bayou	1418 Lake Brownwood	1418A Hords Creek	1418B Jim Ned Creek	1419 Lake Coleman	1420 Pecan Bayou Above Lake Brownwood	1421 Concho River	1421A Dry Hollow Creek	1421B Kickapoo Creek
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	FS	FS	FS	NA	FS	NA	NA	FS	FS	NA	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	FS	X	X	FS	X	X	FS	FS	FS	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	NA	FS	FS	FS	NA	FS	NA	NA	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	FS	FS	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	FS	NA	NA	NA	NA	NA	NA	NA	**NS**	NA	NA
Fish Community	NA	FS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	FS	FS	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	FS	X	FS	NA	X	X	NA	FS	FS	X	X
pH	X	FS	X	FS	NA	X	X	NA	FS	FS	X	X
Chloride	X	FS	X	FS	FS	X	X	FS	FS	FS	X	X
Sulfate	X	FS	X	FS	FS	X	X	FS	FS	FS	X	X
Total Dissolved Solids	X	FS	X	FS	FS	X	X	FS	FS	FS	X	X

Colorado River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Lipan Creek 1421C	Little Concho River 1421D	Lake Nasworthy 1422	Twin Buttes Reservoir 1423	Spring Creek 1423A	Dove Creek 1423B	Middle Concho/South Concho River 1424	O. C. Fisher Lake 1425	North Concho River 1425A	Colorado River Below E. V. Spence Reservoir 1426	Oak Creek Reservoir 1426A	Elm Creek 1426B
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	NA	FS	NA	FS	NA	FS	NA	NA	FS	NA	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	FS	FS	X	X	FS	FS	X	FS	FS	X
Aquatic Life Use												
Dissolved Oxygen grab min	NA	FS	FS	NA	FS	NA	FS	NA	NA	FS	NA	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	FS	NA	X	X	FS	NA	X	FS	X	X
pH	X	X	FS	NA	X	X	FS	NA	X	FS	X	X
Chloride	X	X	FS	FS	X	X	FS	**NS**	X	**NS**	X	X
Sulfate	X	X	FS	FS	X	X	FS	FS	X	FS	X	X
Total Dissolved Solids	X	X	FS	FS	X	X	FS	**NS**	X	**NS**	X	X

Colorado River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	Onion Creek 1427	Slaughter Creek 1427A	Williamson Creek 1427B	Bear Creek 1427C	Boggy Creek 1427D	Marble Creek 1427E	Rinard Creek 1427F	Unnamed Tributary to Slaughter Creek 1427G	Colorado River Below Town Lake 1428	Boggy Creek 1428A	Walnut Creek 1428B	Gilleland Creek 1428C
DESIGNATED USE SUPPORT												
Contact Recreation Use	FS	FS	FS	NA	NA	FS	FS	NA	FS	NA	FS	**NS**
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	FS	X	X	X	X	X	X	X	FS	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	FS	FS	FS	NA	NA	FS	FS	NA	FS	NA	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	FS	**NS**	FS	NA	NA	NA	NA	NA	NA	NA	FS	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	FS	X	X	X	X	X	X	X	FS	X	X	X
pH	FS	X	X	X	X	X	X	X	FS	X	X	X
Chloride	FS	X	X	X	X	X	X	X	FS	X	X	X
Sulfate	FS	X	X	X	X	X	X	X	FS	X	X	X
Total Dissolved Solids	FS	X	X	X	X	X	X	X	FS	X	X	X

Colorado River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	1428D Little Walnut Creek	1428E Fort Branch Creek	1428F Tannehill Branch Creek	1428G Wells Branch	1428H Carson Creek	1428I Decker Creek	1428J Harris Branch	1429 Town Lake	1429A Shoal Creek	1429B Eanes Creek	1429C Waller Creek	1429D East Bouldin Creek
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	X	X	FS	X	X	X	X
Aquatic Life Use												
Dissolved Oxygen grab min	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	NA	FS	NA	NA	NA	NA	FS	NA	FS	NA	**NS**	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	FS	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	X	X	X	X	X	FS	X	X	X	X
pH	X	X	X	X	X	X	X	FS	X	X	X	X
Chloride	X	X	X	X	X	X	X	FS	X	X	X	X
Sulfate	X	X	X	X	X	X	X	FS	X	X	X	X
Total Dissolved Solids	X	X	X	X	X	X	X	FS	X	X	X	X

Colorado River Basin Tabular Summary of Use Support (continued)

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	West Bouldin Creek 1429E	Blunn Creek 1429F	Harper's Branch 1429G	Johnson Creek 1429H	Barton Creek 1430	Barton Springs 1430A	Tributaries to Barton Creek 1430B	Mid Pecan Bayou 1431	Upper Pecan Bayou 1432	O. H. Ivie Reservoir 1433	Colorado River above La Grange 1434	Cedar Creek 1434B
DESIGNATED USE SUPPORT												
Contact Recreation Use	NA	NA	NA	NA	FS	FS	FS	FS	FS	NA	FS	FS
Noncontact Recreation Use	X	X	X	X	X	X	X	X	X	X	X	X
Public Water Supply Use	X	X	X	X	X	X	X	X	FS	FS	FS	X
Aquatic Life Use												
Dissolved Oxygen grab min	NA	NA	NA	NA	FS	FS	FS	FS	FS	FS	FS	FS
Dissolved Oxygen 24-hour avg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen 24-hour min	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organics in water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment Toxicity tests	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Habitat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macrobenthos Community	FS	FS	NA	NA	FS	NA	FS	NA	NA	NA	NA	NA
Fish Community	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Consumption Use												
Advisories and Closures	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Human Health Criteria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GENERAL USE SUPPORT												
Water Temperature	X	X	X	X	FS	X	X	FS	FS	FS	FS	X
pH	X	X	X	X	FS	X	X	FS	FS	NA	FS	X
Chloride	X	X	X	X	FS	X	X	FS	FS	NA	FS	X
Sulfate	X	X	X	X	FS	X	X	FS	FS	NA	FS	X
Total Dissolved Solids	X	X	X	X	FS	X	X	FS	FS	NA	NA	X

Key to support codes FS = fully supporting PS = partially supporting NS = not supporting NA = not assessed X = not applicable	1434C Lake Bastrop
DESIGNATED USE SUPPORT	
Contact Recreation Use	FS
Noncontact Recreation Use	X
Public Water Supply Use	X
Aquatic Life Use	
Dissolved Oxygen grab min	FS
Dissolved Oxygen 24-hour avg	NA
Dissolved Oxygen 24-hour min	NA
Metals in water	NA
Organics in water	NA
Water Toxicity tests	NA
Sediment Toxicity tests	NA
Habitat	NA
Macrobenthos Community	NA
Fish Community	NA
Fish Consumption Use	
Advisories and Closures	NA
Human Health Criteria	NA
GENERAL USE SUPPORT	
Water Temperature	X
pH	X
Chloride	X
Sulfate	X
Total Dissolved Solids	X

Colorado River Basin Tabular Summary of Water Quality Concerns

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Colorado River Tidal 1401	Colorado River Below La Grange 1402	Cummins Creek 1402A	Buckners Creek 1402**C**	Blue Creek 1402F	Fayette Reservoir 1402G	Skull Creek 1402H	Lake Austin 1403	Bull Creek 1403A	West Bull Creek 1403B	Cow Fork Bull Creek 1403**C**	Barrow Preserve Tributary 1403D
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NC	NA	NC	NA	NC	NC	NC	NA	NC
Nitrite + Nitrate Nitrogen	NC	NC	NC	NC	NA	NC	NA	NC	NC	NC	NA	**C**
Orthophosphorus	NC	NC	NC	NC	NA	NC	NA	NC	NC	NC	NA	NC
Total Phosphorus	NC	NC	NC	NC	NA	NC	NA	NC	NC	NC	NA	NC
Algal Growth												
Chlorophyll *a*	NC	NC	NC	**C**	NA	**C**	NA	NC	NC	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	NC	X	X	X	NC	X	NC	X	X	X	X
Finished Water: Sulfate	X	NC	X	X	X	NC	X	NC	X	X	X	X
Finished Water: TDS	X	NC	X	X	X	NC	X	NC	X	X	X	X
Surface Water: Chloride	X	NC	X	X	X	NC	X	NC	X	X	X	X
Surface Water: Sulfate	X	NC	X	X	X	NC	X	NC	X	X	X	X
Surface Water: TDS	X	NC	X	X	X	NC	X	NC	X	X	X	X

Colorado River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Stillhouse Hollow 1403E	Unnamed Tributary to Bull Creek 1403F	Tanglewood Tributary to Bull Creek 1403G	Unnamed Tributary to Bull Creek 1403H	Unnamed Tributary to Bull Creek 1403I	Spicewood Tributary to Shoal Creek 1403J	Taylor Slough South 1403K	Unnamed Tributary to Lake Austin 1403L	Turkey Creek 1403M	Panther Hollow Creek 1403N	Cuernavaca Creek 1403O	Bee Creek 1403P
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	NC
Nitrite + Nitrate Nitrogen	**C**	NC	NC	NC	NC	**C**	**C**	NC	NA	NA	NA	NC
Orthophosphorus	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	NC
Total Phosphorus	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	X	X	X	X	X	X	X	X	X	X
Finished Water: Sulfate	X	X	X	X	X	X	X	X	X	X	X	X
Finished Water: TDS	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: Chloride	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: Sulfate	X	X	X	X	X	X	X	X	X	X	X	X
Surface Water: TDS	X	X	X	X	X	X	X	X	X	X	X	X

Colorado River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Bear Creek 1403Q	Unnamed tributary to Lake Austin 1403R	Lake Travis 1404	Hamilton Creek 1404A	Cow Creek 1404B	Long Hollow Creek 1404C	Marble Falls Lake 1405	Lake Lyndon B. Johnson 1406	Sandy Creek 1406A	Inks Lake 1407	Lake Buchanan 1408	Colorado River Above Lake Buchanan 1409
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NC	NC	NA	NA	NA	NC	NC	NC	**C**	NC	NC
Nitrite + Nitrate Nitrogen	NA	NC	NC	NA	NA	NA	NC	NC	NC	NC	NC	NC
Orthophosphorus	NA	NC	NC	NA	NA	NA	NC	NC	NC	NC	NC	NC
Total Phosphorus	NA	NA	NC	NA	NA	NA	NC	NC	NC	NC	NC	NC
Algal Growth												
Chlorophyll *a*	NA	NA	NC	NA	NA	NA	NC	NC	NC	NC	**C**	NC
Public Water Supply												
Finished Water: Chloride	X	X	NC	X	X	X	NC	NC	X	NC	NC	NC
Finished Water: Sulfate	X	X	NC	X	X	X	NC	NC	X	NC	NC	NC
Finished Water: TDS	X	X	NC	X	X	X	NC	NC	X	NC	NC	NC
Surface Water: Chloride	X	X	NC	X	X	X	NC	NC	X	NC	NC	NC
Surface Water: Sulfate	X	X	NC	X	X	X	NC	NC	X	NC	NC	NC
Surface Water: TDS	X	X	NC	X	X	X	NC	NC	X	NC	NC	NC

Colorado River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Colorado River Below O. H. Ivie Reservoir 1410	E. V. Spence Reservoir 1411	Colorado River Below Lake J. B. Thomas 1412	Lake Colorado City 1412A	Beals Creek 1412B	Deep Creek 1412C	Lake J. B. Thomas 1413	Pedernales River 1414	Cypress Creek 1414B	Live Oak Creek 1414C	Miller Creek 1414D	Llano River 1415
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NA	NC	NA	NA	NA	NA	NC	NC	NA	NA	NC
Nitrite + Nitrate Nitrogen	NC	NA	NC	NA	**C**	NA	NA	NC	NC	NA	NA	NC
Orthophosphorus	NC	NA	NC	NA	NA	NA	NA	NC	NC	NA	NA	NC
Total Phosphorus	NC	NA	NA	NA	NA	NA	NA	NC	NC	NA	NA	NC
Algal Growth												
Chlorophyll *a*	NC	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
Public Water Supply												
Finished Water: Chloride	NC	NA	X	NC	X	X	NC	NC	X	X	X	NC
Finished Water: Sulfate	NC	NA	X	**C**	X	X	NC	NC	X	X	X	NC
Finished Water: TDS	NC	NA	X	**C**	X	X	NC	NC	X	X	X	NC
Surface Water: Chloride	**C**	**C**	X	NA	X	X	NA	NC	X	X	X	NC
Surface Water: Sulfate	NC	**C**	X	NA	X	X	NA	NC	X	X	X	NC
Surface Water: TDS	NC	**C**	X	NA	X	X	NA	NC	X	X	X	NC

Colorado River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	1415A Johnson Fork Creek	1416 San Saba River	1416A Brady Creek	1417 Lower Pecan Bayou	1418 Lake Brownwood	1418A Hords Creek	1418B Jim Ned Creek	1419 Lake Coleman	1420 Pecan Bayou Above Lake Brownwood	1421 Concho River	1421A Dry Hollow Creek	1421B Kickapoo Creek
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NC	NC	NC	NA	NC	NA	NC	NC	**C**	NA	NA
Nitrite + Nitrate Nitrogen	NA	NC	**C**	**C**	NA	NC	NA	NC	NC	**C**	**C**	**C**
Orthophosphorus	NA	NC	**C**	NC	NA	NC	NA	NC	NC	NC	NA	NA
Total Phosphorus	NA	NC	**C**	NC	NA	NC	NA	NC	NA	NC	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NC	**C**	**C**	NA	**C**	NA	NC	NA	**C**	NA	NA
Public Water Supply												
Finished Water: Chloride	X	NC	X	X	NC	X	X	NC	NC	**C**	X	X
Finished Water: Sulfate	X	NC	X	X	NC	X	X	NC	NC	**C**	X	X
Finished Water: TDS	X	NC	X	X	NC	X	X	NC	NC	**C**	X	X
Surface Water: Chloride	X	NC	X	X	NC	X	X	NC	NC	**C**	X	X
Surface Water: Sulfate	X	NC	X	X	NC	X	X	NC	NC	**C**	X	X
Surface Water: TDS	X	NC	X	X	NC	X	X	NC	NC	**C**	X	X

Colorado River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Lipan Creek 1421C	Little Concho River 1421D	Lake Nasworthy 1422	Twin Buttes Reservoir 1423	Spring Creek 1423A	Dove Creek 1423B	Middle Concho/South Concho River 1424	O. C. Fisher Lake 1425	North Concho River 1425A	Colorado River Below E. V. Spence Reservoir 1426	Oak Creek Reservoir 1426A	Elm Creek 1426B
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NA	**C**	NA	**C**	NA	NC	**C**	NA	**C**	NA	NA
Nitrite + Nitrate Nitrogen	NA	**C**	NC	NA	NC	NA	NC	NC	NA	NC	NA	**C**
Orthophosphorus	NA	NA	NC	NA	NC	NA	NC	NC	NA	NC	NA	NA
Total Phosphorus	NA	NA	NC	NA	NA	NA	NC	NA	NA	NC	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NC	NA	NA	NA	NC	NA	NA	**C**	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	NC	NC	X	X	NC	NC	X	NC	NA	X
Finished Water: Sulfate	X	X	NC	NC	X	X	NC	NC	X	NC	**C**	X
Finished Water: TDS	X	X	NC	NC	X	X	NC	NC	X	NC	NA	X
Surface Water: Chloride	X	X	**C**	NC	X	X	NC	**C**	X	**C**	NA	X
Surface Water: Sulfate	X	X	NC	NC	X	X	NC	NC	X	**C**	NA	X
Surface Water: TDS	X	X	NC	NC	X	X	NC	NC	X	**C**	NA	X

Colorado River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Onion Creek 1427	Slaughter Creek 1427A	Williamson Creek 1427B	Bear Creek 1427C	Boggy Creek 1427D	Marble Creek 1427E	Rinard Creek 1427F	Unnamed Tributary to Slaughter Creek 1427G	Colorado River Below Town Lake 1428	Boggy Creek 1428A	Walnut Creek 1428B	Gilleland Creek 1428C
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	**C**	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NC	NC	NC	NA	NA	NC	NC	NA	NC	NA	NC	NC
Nitrite + Nitrate Nitrogen	NC	NC	NC	NA	NA	NC	NC	NA	**C**	NA	**C**	**C**
Orthophosphorus	NC	NC	NC	NA	NA	NC	NC	NA	**C**	NA	NC	**C**
Total Phosphorus	NC	NC	NC	NA	NA	NC	NC	NA	NC	NA	**C**	NC
Algal Growth												
Chlorophyll *a*	NC	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NC
Public Water Supply												
Finished Water: Chloride	NC	X	X	X	X	X	X	X	NC	X	X	X
Finished Water: Sulfate	NC	X	X	X	X	X	X	X	NC	X	X	X
Finished Water: TDS	NC	X	X	X	X	X	X	X	NC	X	X	X
Surface Water: Chloride	NC	X	X	X	X	X	X	X	NC	X	X	X
Surface Water: Sulfate	NC	X	X	X	X	X	X	X	NC	X	X	X
Surface Water: TDS	NC	X	X	X	X	X	X	X	NC	X	X	X

Colorado River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Little Walnut Creek 1428D	Fort Branch Creek 1428E	Tannehill Branch Creek 1428F	Wells Branch 1428G	Carson Creek 1428H	Decker Creek 1428I	Harris Branch 1428J	Town Lake 1429	Shoal Creek 1429A	Eanes Creek 1429B	Waller Creek 1429C	East Bouldin Creek 1429D
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**C**
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	**C**	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA
Nitrite + Nitrate Nitrogen	NA	NA	NA	NA	NA	NA	NA	**C**	NA	NA	NA	NA
Orthophosphorus	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA
Total Phosphorus	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA
Public Water Supply												
Finished Water: Chloride	X	X	X	X	X	X	X	NC	X	X	X	X
Finished Water: Sulfate	X	X	X	X	X	X	X	NC	X	X	X	X
Finished Water: TDS	X	X	X	X	X	X	X	NC	X	X	X	X
Surface Water: Chloride	X	X	X	X	X	X	X	NC	X	X	X	X
Surface Water: Sulfate	X	X	X	X	X	X	X	NC	X	X	X	X
Surface Water: TDS	X	X	X	X	X	X	X	NC	X	X	X	X

Colorado River Basin Tabular Summary of Water Quality Concerns (continued)

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	West Bouldin Creek 1429E	Blunn Creek 1429F	Harper's Branch 1429G	Johnson Creek 1429H	Barton Creek 1430	Barton Springs 1430A	Tributaries to Barton Creek 1430B	Mid Pecan Bayou 1431	Upper Pecan Bayou 1432	O. H. Ivie Reservoir 1433	Colorado River above La Grange 1434	Cedar Creek 1434B
WATER QUALITY CONCERNS												
Sediment Contaminants	NA	NA	NA	NA	**C**	**C**	NA	NA	NA	NA	NA	NA
Fish Tissue Contaminants	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Narrative	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nutrient Enrichment												
Ammonia Nitrogen	NA	NA	NA	NA	NC	NC	NC	NC	NC	NA	NC	NC
Nitrite + Nitrate Nitrogen	NA	NA	NA	NA	NC	NC	NC	**C**	NC	NA	**C**	NC
Orthophosphorus	NA	NA	NA	NA	NC	NC	NC	**C**	NC	NA	NC	NC
Total Phosphorus	NA	NA	NA	NA	NC	NC	NC	**C**	NC	NA	NC	NC
Algal Growth												
Chlorophyll *a*	NA	NA	NA	NA	NC	NC	NA	NC	NC	NA	NC	NC
Public Water Supply												
Finished Water: Chloride	X	X	X	X	X	X	X	X	NC	NC	NC	X
Finished Water: Sulfate	X	X	X	X	X	X	X	X	NC	NC	NC	X
Finished Water: TDS	X	X	X	X	X	X	X	X	NC	NC	NC	X
Surface Water: Chloride	X	X	X	X	X	X	X	X	NC	**C**	NC	X
Surface Water: Sulfate	X	X	X	X	X	X	X	X	NC	NC	NC	X
Surface Water: TDS	X	X	X	X	X	X	X	X	NC	**C**	NA	X

Key to concern codes NC = no concern C = concern TH = threatened NA = not assessed X = not applicable	Lake Bastrop 1434C
WATER QUALITY CONCERNS	
Sediment Contaminants	NA
Fish Tissue Contaminants	NA
Narrative	NC
Nutrient Enrichment	
Ammonia Nitrogen	NC
Nitrite + Nitrate Nitrogen	NC
Orthophosphorus	NC
Total Phosphorus	NC
Algal Growth	
Chlorophyll *a*	NC
Public Water Supply	
Finished Water: Chloride	X
Finished Water: Sulfate	X
Finished Water: TDS	X
Surface Water: Chloride	X
Surface Water: Sulfate	X
Surface Water: TDS	X

Appendix 5B

Lake Level Graphs and Tables

Figure 5B-1: Lake Conroe Elevation

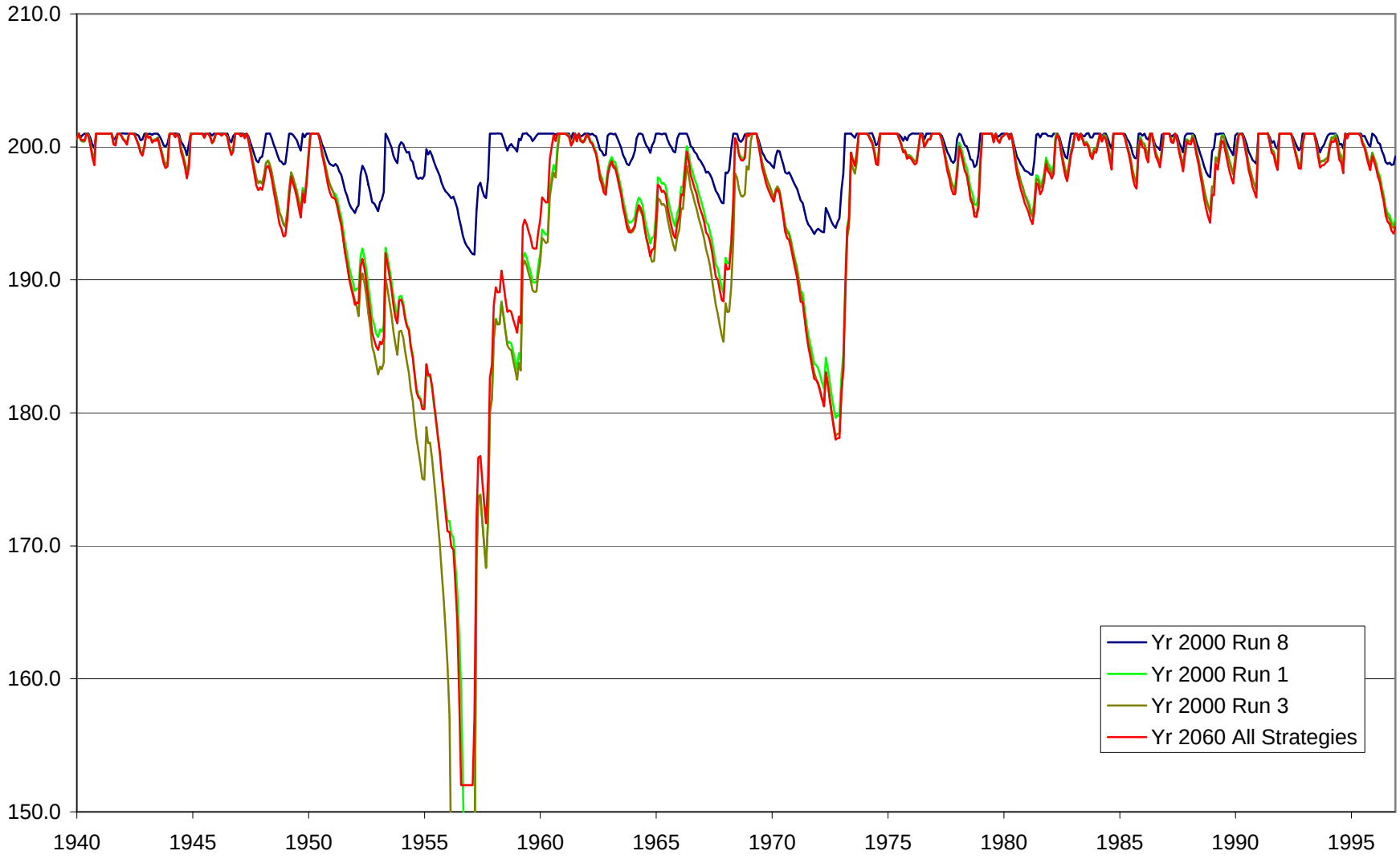


Figure 5B-2: Lake Conroe Elevation Percentiles

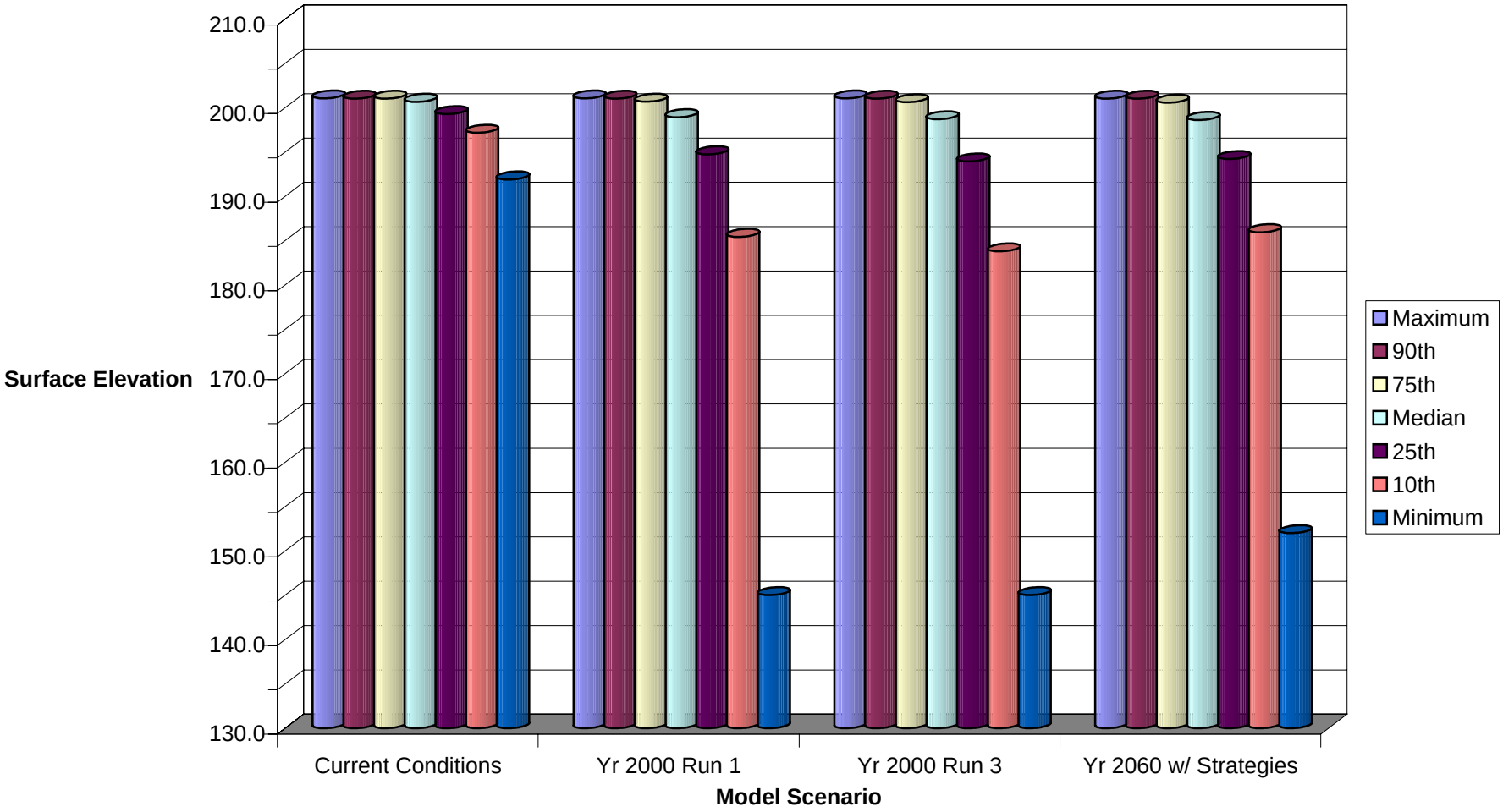


Figure 5B-3: Lake Houston Elevation

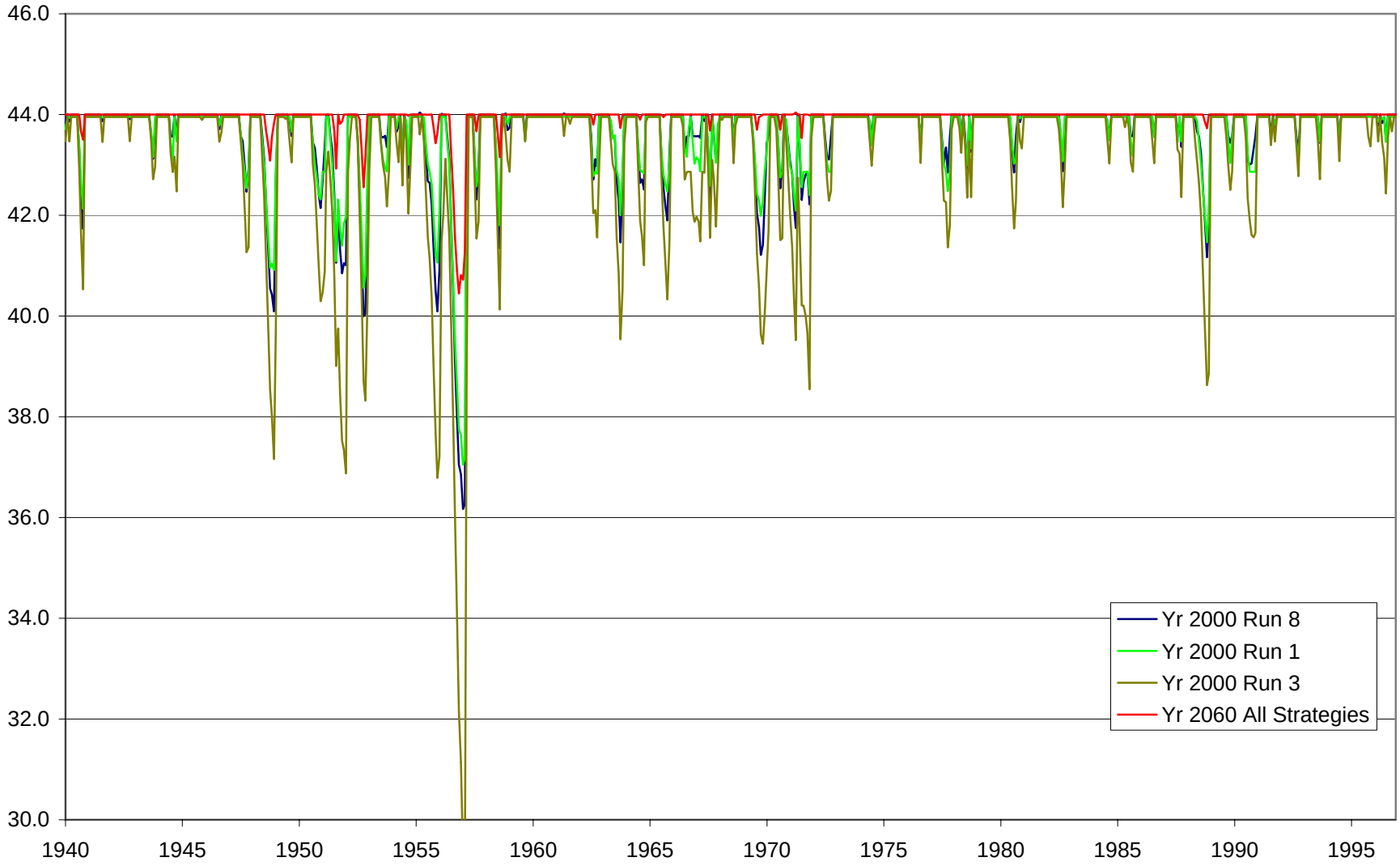


Figure 5B-4: Lake Houston Elevation Percentiles

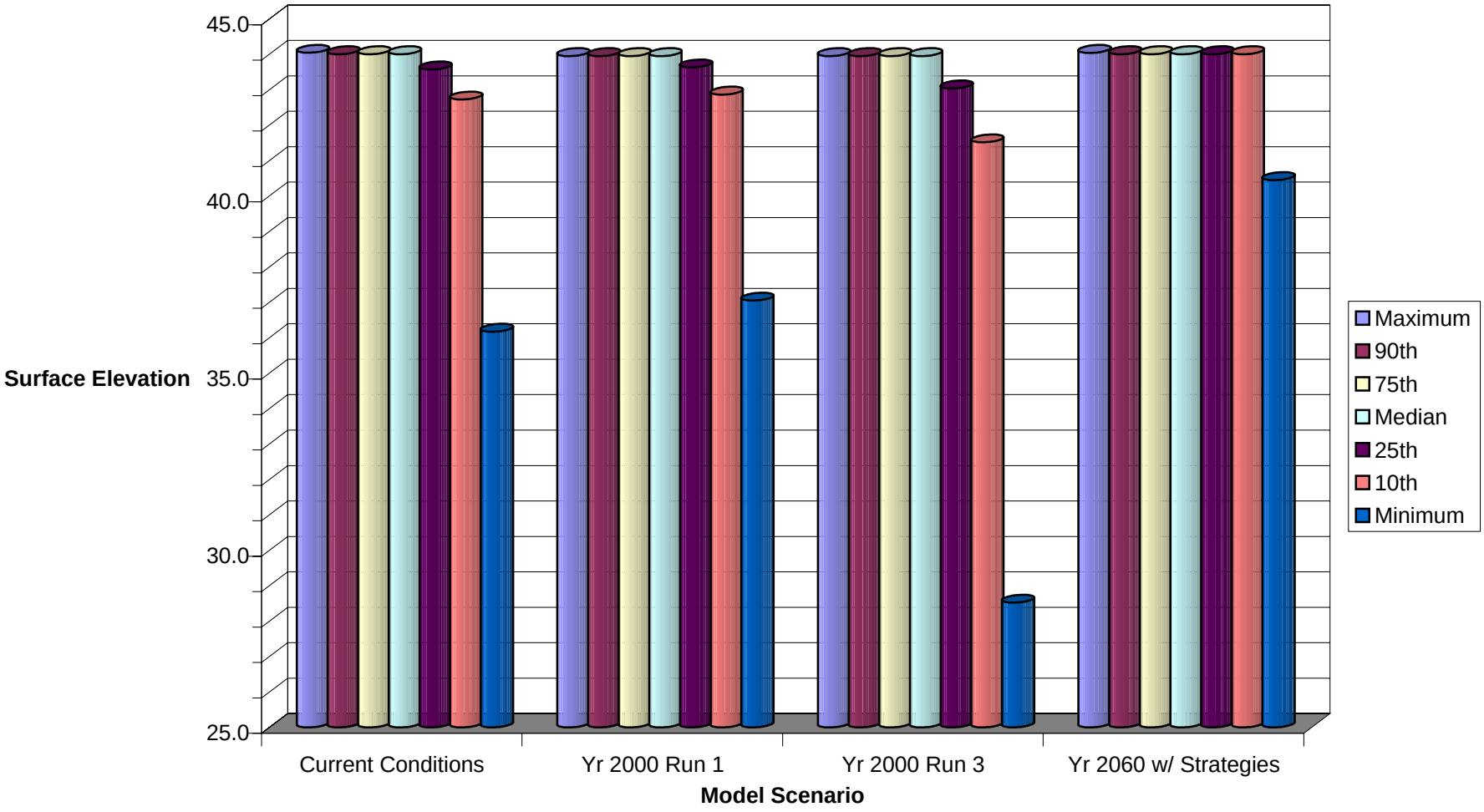


Figure 5B-5: Lake Livingston Elevation

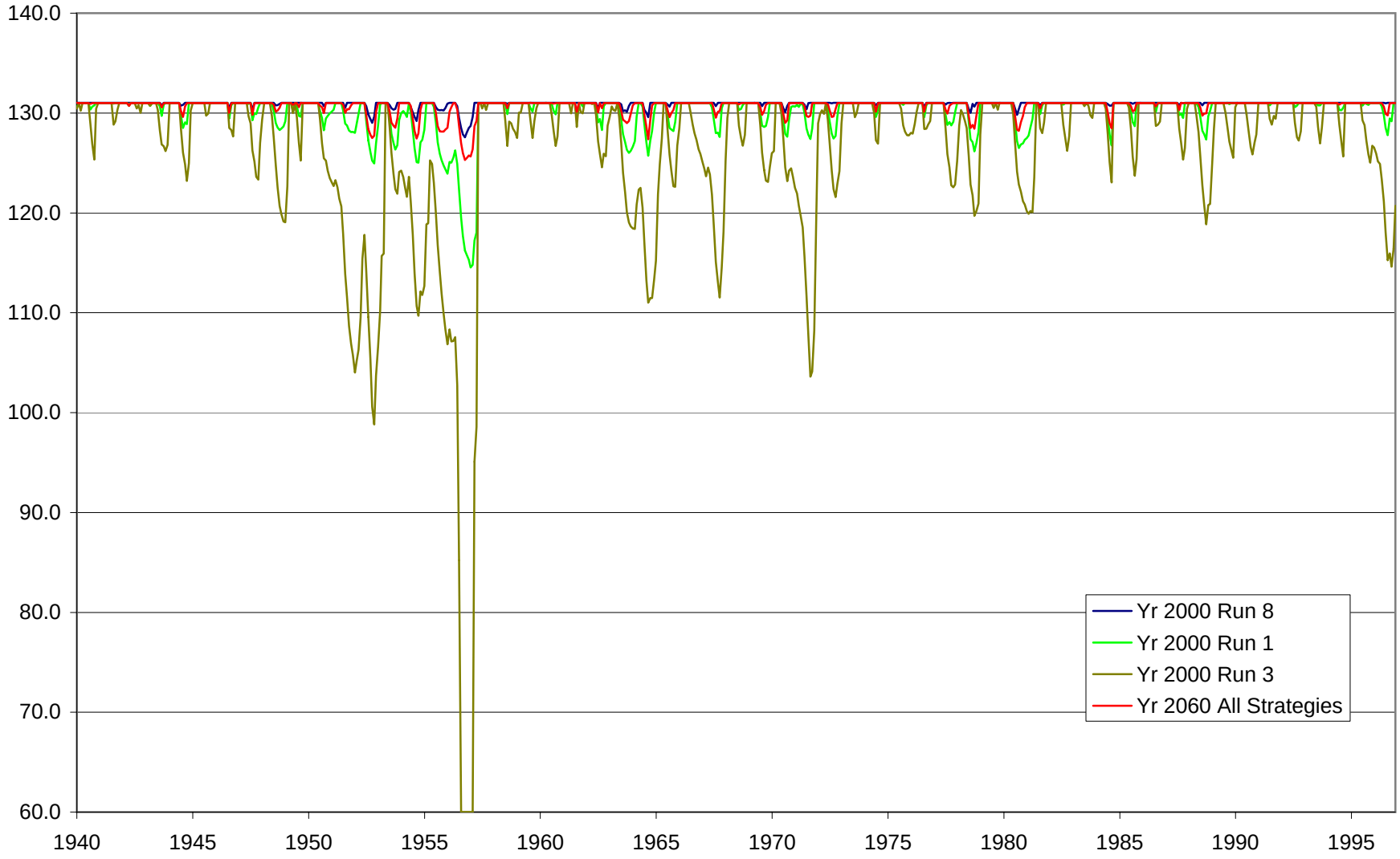
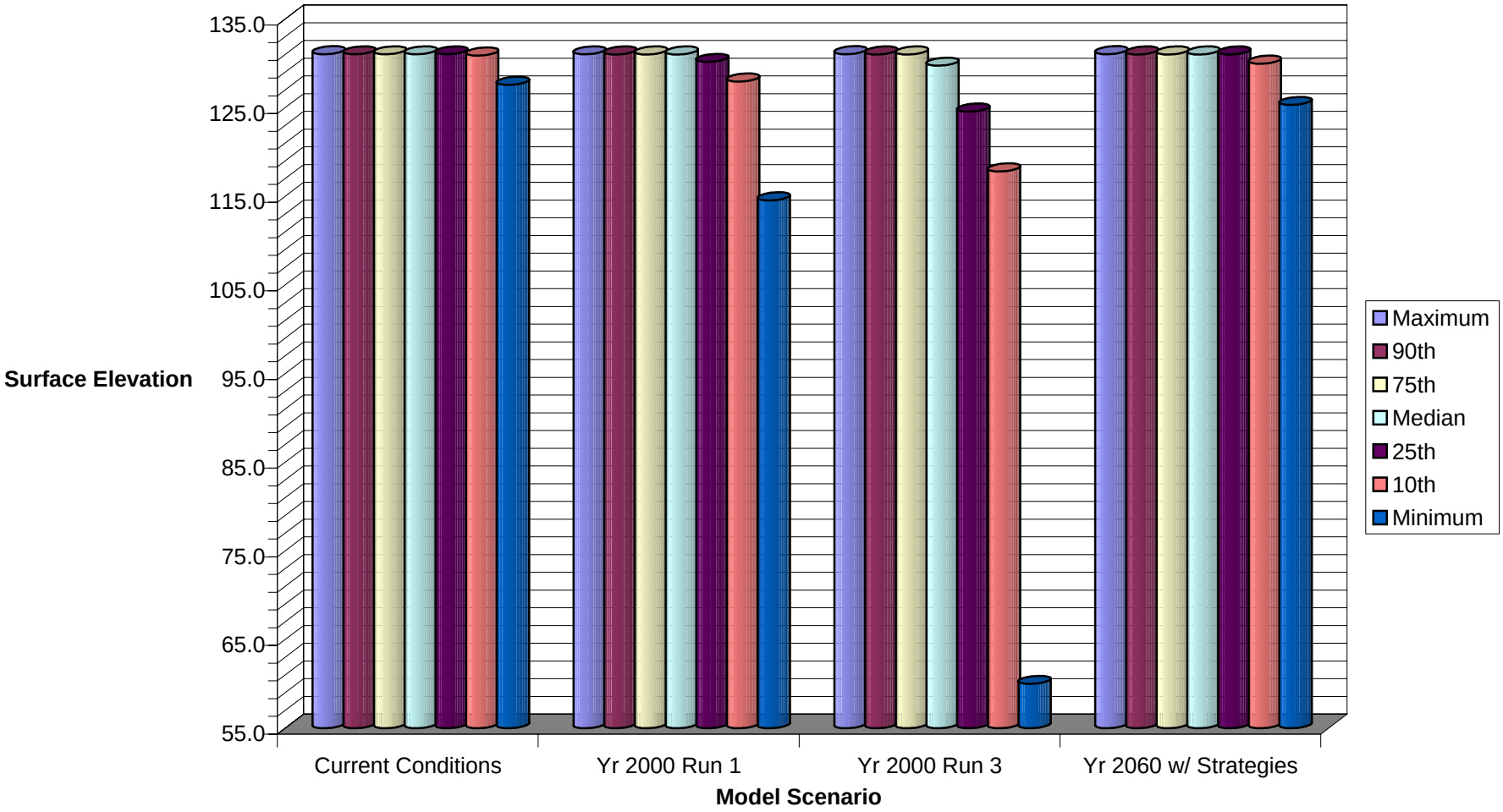


Figure 5B-6: Lake Livingston Elevation Percentiles



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6. Water Conservation and Drought Management Plans

This chapter presents the minimum necessary requirements for conservation plans and drought contingency plans and provides (at the end of the Chapter) model conservation plans and drought contingency plans for the various water user categories. The model conservation plans and drought contingency plans were developed specifically for Region H in accordance with and as described in Texas Water Code 11.1271 and 11.1272.

6.1 Water Conservation Plan

Water conservation plans are required by the Texas Commission on Environmental Quality (TCEQ, formerly the TNRCC)/Texas Water Development Board (TWDB) for the following water users:

- Applicants who apply for TWDB loan requests
- Applicants for new or amended water rights
- Any holder of an existing permit, certified filing, or certificate of adjudication if requested by TCEQ/TWDB for appropriation of a water right greater than 1000 acre-feet per year for municipal, industrial, and other uses excluding irrigation. For irrigation uses, the threshold is 10,000 acre-feet per year.

Conservation plans developed for submittal with water right applications for appropriation of State water should discuss the evaluation of water conservation with respect to their application. This would include discussions of water conservation as an alternative to the potentially appropriated State water as well as the evaluation of any other conservation Best Management Practices (BMP) as an alternative to the new water right.

Minimum conservation and drought management plan requirements for specific water use categories are discussed in the following subsections.

6.1.1 Municipal Uses by Public Water Suppliers[1]

Water conservation plans for municipal water use by public water suppliers (i.e., documented Region H Municipal Water User Groups) must include specific information as listed below. If the plans do not provide information for each requirement, the public water supplier shall include in the plans an explanation of why the requirement is not applicable.

- A utility profile including, but not limited to, information regarding population and customer data, water use data, water supply system data, and wastewater system data.

- Specification of conservation goals including, but not limited to, municipal per capita water use goals, the basis for the development of such goals, and a time frame for achieving the specified goals (until May 1, 2005).

[1] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30 Part 1 Chapter 288 Subchapter A Rule 288.2

- Specific, quantified 5-year and 10-year targets for water savings to include goals for water loss programs and goals for municipal use in gallons per capita per day. The goals established by a public water supplier under this subparagraph are not enforceable.

- Metering device(s) within an accuracy of plus or minus 5.0 percent in order to measure and account for the amount of water diverted from the source of supply.

- A program for universal metering of both customer and public uses of water, for meter testing and repair, and for periodic meter replacement.

- Measures to determine and control unaccounted-for uses of water (for example: periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections, abandoned services, etc.).

- A program of continuing public education and information regarding water conservation.

- A water rate structure which is not "promotional," i.e., a rate structure which is cost-based and which does not encourage the excessive use of water.

- A reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin in order to optimize available water supplies.

- A means of implementation and enforcement which should be shown by either of the following:

    1. A copy of the ordinance, resolution, or tariff indicating official adoption of the water conservation plan by the water supplier, or

    2. A description of the authority by which the water supplier will implement and enforce the conservation plan.

- Documentation of coordination with the Region H Regional Water Planning Group for the service area of the public water supplier to ensure consistency with the appropriate, approved Region H Regional Water Plan.

Water conservation plans for municipal uses by public drinking water suppliers serving a current population of 5,000 or more and/or a projected population of 5,000 or more within the next 10 years subsequent to the effective date of the plan must also include the following information:

- A program of leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system to control unaccounted-for uses of water.

- A record management system to record water pumped, water deliveries, water sales, and water losses that allows for the separation of water sales and uses into residential, commercial, public and institutional, and industrial users.

- A requirement in every wholesale water supply contract entered into or renewed after official adoption of the plan (by either ordinance, resolution, or tariff), and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements in this chapter. If the customer intends to resell the water, the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with the provisions of this chapter.

If the conservation goals cannot be achieved through the minimum conservation plan requirements, the water supplier can implement water conservation strategies to help achieve their goals. The TCEQ can also require the water supplier to implement a conservation BMP strategy to achieve the goals set in the conservation plan. Some of the water conservation BMPs are listed below, and a more detailed list can be found in the *Water Conservation Best Management Practices Guide, Report 362. Texas Water Development Board, November 2004.*

- Conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates.

- Adoption of ordinances, plumbing codes, and/or rules requiring water-conserving plumbing fixtures to be installed in new structures and existing structures undergoing substantial modification or addition.

- A program encouraging the replacement or retrofit of existing structures built prior to 1991 with water conserving plumbing fixtures.

- Reuse and/or recycling of wastewater and/or graywater.

- A program for pressure control and/or reduction in the distribution system and/or for customer connections.

- A program and/or ordinance(s) for landscape water management.

- A method for monitoring the effectiveness and efficiency of the water conservation plan.

- Any other water conservation practice, method, or technique which the water supplier shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

A water conservation plan prepared in accordance with *31 TAC §363.15* (relating to Required Water Conservation Plan) of the TWDB, and substantially meeting the requirements of this section and other applicable commission rules, may be submitted to meet application requirements in accordance with a memorandum of understanding between the commission and the TWDB.

Beginning May 1, 2005, a public water supplier for municipal use shall review and update its water conservation plan, as appropriate, based on an assessment of previous 5-year and 10-year targets and any other new or updated information. The public water supplier for municipal use shall review and update the next revision of its water conservation plan no later than May 1, 2009, and every five years after that date to coincide with the Region H Water Planning Group's regional water plan update.

6.1.2 Industrial or Mining[2]

Water conservation plans for industrial or mining uses of water must provide the information as outlined below. If the plan does not provide information for each requirement, the industrial or mining water user shall include in the plan an explanation of why the requirement is not applicable.

- A description of the use of the water in the production process, including how the water is diverted and transported from the source(s) of supply, how the water is utilized in the production process, and the estimated quantity of water consumed in the production process and therefore unavailable for reuse, discharge, or other means of disposal.

- Until May 1, 2005, specification of conservation goals, the basis for the development of such goals, and a time frame for achieving the specified goals.

- Beginning May 1, 2005, specific, quantified 5-year and 10-year targets for water savings and the basis for the development of such goals. The goals established by industrial or mining water users under this paragraph are not enforceable.

- A description of the device(s) and/or method(s) within an accuracy of plus or minus 5.0 percent to be used in order to measure and account for the amount of water diverted from the source of supply.

- Leak-detection, repair, and accounting for water loss in the water distribution system.

- Application of state-of-the-art equipment and/or process modifications to improve water use efficiency.

- Any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

Beginning May 1, 2005, an industrial or mining water user shall review and update its water conservation plan, as appropriate, based on an assessment of previous 5-year and 10-year targets and any other new or updated information. The industrial or mining water user shall review and update the next revision of its water conservation plan no later than May 1, 2009, and every 5 years after that date to coincide with the Region H Water Planning Group regional water plan update.

[2] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30 Part 1 Chapter 288 Subchapter A Rule 288.3

6.1.3 Agriculture[3]

A water conservation plan for agricultural use of water must provide information in response to the following subsections. If the plan does not provide information for each requirement, the agricultural water user must include in the plan an explanation of why the requirement is not applicable.

For an individual agricultural user other than for irrigation:

- A description of the use of the water in the production process, including how the water is diverted and transported from the source(s) of supply, how the water is utilized in the production process, and the estimated quantity of water consumed in the production process and therefore unavailable for reuse, discharge, or other means of disposal.

- Until May 1, 2005, specification of conservation goals, the basis for the development of such goals, and a time frame for achieving the specified goals.

- Beginning May 1, 2005, specific, quantified five-year and ten-year targets for water savings and the basis for the development of such goals. The goals established by agricultural water users under this subparagraph are not enforceable.

- A description of the device(s) and/or method(s) within an accuracy of plus or minus 5.0 percent to be used in order to measure and account for the amount of water diverted from the source of supply.

- Leak-detection, repair, and accounting for water loss in the water distribution system.

- Application of state-of-the-art equipment and/or process modifications to improve water use efficiency.

- Any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

For an individual agricultural irrigation user:

- A description of the irrigation production process which shall include, but is not limited to, the type of crops and acreage of each crop to be irrigated, monthly irrigation diversions, any seasonal or annual crop rotation, and soil types of the land to be irrigated.

- A description of the irrigation method or system and equipment including pumps, flow rates, plans, and/or sketches of the system layout.

- A description of the device(s) and/or methods within an accuracy of plus or minus 5.0 percent to be used in order to measure and account for the amount of water diverted from the source of supply.

[3] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30 Part 1 Chapter 288 Subchapter A Rule 288.4

- Until May 1, 2005, specification of conservation goals including, where appropriate, quantitative goals for irrigation water use efficiency and a pollution abatement and prevention plan.

- Beginning May 1, 2005, specific, quantified 5-year and 10-year targets for water savings including, where appropriate, quantitative goals for irrigation water use efficiency and a pollution abatement and prevention plan. The goals established by an individual irrigation water user under this subparagraph are not enforceable.

- Water-conserving irrigation equipment and application system or method including, but not limited to, surge irrigation, low pressure sprinkler, drip irrigation, and nonleaking pipe.

- Leak-detection, repair, and water-loss control.

- Scheduling the timing and/or measuring the amount of water applied (e.g., soil moisture monitoring).

- Land improvements for retaining or reducing runoff and increasing the infiltration of rain and irrigation water including, but not limited to, land leveling, furrow diking, terracing, and weed control.

- Tailwater recovery and reuse.

- Any other water conservation practice, method, or technique which the user shows to be appropriate for preventing waste and achieving conservation.

For a system providing agricultural water to more than one user:

- A system inventory for the supplier's:

    - Structural facilities including the supplier's water storage, conveyance, and delivery structures.

    - Management practices, including the supplier's operating rules and regulations, water pricing policy, and a description of practices and/or devices used to account for water deliveries.

    - A user profile including square miles of the service area, the number of customers taking delivery of water by the system, the types of crops, the types of irrigation systems, the types of drainage systems, and total acreage under irrigation, both historical and projected.

- Until May 1, 2005, specification of water conservation goals, including maximum allowable losses for the storage and distribution system.

- Beginning May 1, 2005, specific, quantified 5-year and 10-year targets for water savings including maximum allowable losses for the storage and distribution system. The goals

established by a system providing agricultural water to more than one user under this subparagraph are not enforceable.

- A description of the practice(s) and/or device(s) which will be utilized to measure and account for the amount of water diverted from the source(s) of supply.
- A monitoring and record management program of water deliveries, sales, and losses.
- A leak-detection, repair, and water loss control program.
- A program to assist customers in the development of on-farm water conservation and pollution prevention plans and/or measures.
- A requirement in every wholesale water supply contract entered into or renewed after official adoption of the plan (by either ordinance, resolution, or tariff), and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements in this chapter. If the customer intends to resell the water, the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with applicable provisions of this chapter.
- Official adoption of the water conservation plan and goals, by ordinance, rule, resolution, or tariff, indicating that the plan reflects official policy of the supplier.
- Any other water conservation practice, method, or technique which the supplier shows to be appropriate for achieving conservation.
- Documentation of coordination with the regional water planning groups in order to ensure consistency with appropriate approved regional water plans.

A water conservation plan prepared in accordance with the rules of the United States Department of Agriculture Natural Resource Conservation Service, the Texas State Soil and Water Conservation Board, or other Federal or State agencies and substantially meeting the requirements of this section and other applicable commission rules may be submitted to meet application requirements in accordance with a memorandum of understanding between the commission and that agency.

Beginning May 1, 2005, an agricultural water user shall review and update its water conservation plan, as appropriate, based on an assessment of previous 5-year and 10-year targets and any other new or updated information. An agricultural water user shall review and update the next revision of its water conservation plan no later than May 1, 2009, and every 5 years after that date to coincide with the Region H Water Planning Group regional water plan update.

6.1.4 Wholesale Water Providers[4]

A water conservation plan for a wholesale water supplier must provide information in response to each of the following paragraphs. If the plan does not provide information for each requirement, the wholesale water supplier shall include in the plan an explanation of why the requirement is not applicable.

- A description of the wholesaler's service area, including population and customer data, water use data, water supply system data, and wastewater data.

- Until May 1, 2005, specification of conservation goals including, where appropriate, target per capita water use goals for the wholesaler's service area, maximum acceptable unaccounted-for water, the basis for the development of these goals, and a time frame for achieving these goals.

- Beginning May 1, 2005, specific, quantified 5-year and 10-year targets for water savings including, where appropriate, target goals for municipal use in gallons per capita per day for the wholesaler's service area, maximum acceptable unaccounted-for water, and the basis for the development of these goals. The goals established by wholesale water suppliers under this subparagraph are not enforceable.

- A description as to which practice(s) and/or device(s) will be utilized to measure and account for the amount of water diverted from the source(s) of supply.

- A monitoring and record management program for determining water deliveries, sales, and losses.

- A program of metering and leak detection and repair for the wholesaler's water storage, delivery, and distribution system.

- A requirement in every water supply contract entered into or renewed after official adoption of the water conservation plan, and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements of this chapter. If the customer intends to resell the water, the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with applicable provisions of this chapter.

- A reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin. The reservoir systems operations plans shall include optimization of water supplies as one of the significant goals of the plan.

[4] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30 Part 1 Chapter 288 Subchapter A Rule 288.5

- A means for implementation and enforcement, which shall be evidenced by a copy of the ordinance, rule, resolution, or tariff, indicating official adoption of the water conservation plan by the water supplier; and a description of the authority by which the water supplier will implement and enforce the conservation plan.

- Documentation of coordination with the regional water planning groups for the service area of the wholesale water supplier in order to ensure consistency with the Region H Regional Water Plan.

6.1.5 Additional Conservation Strategies

Any combination of the following strategies shall be selected by the water wholesaler, in addition to the minimum requirements of paragraph (1) of this section, if they are necessary in order to achieve the stated water conservation goals of the plan. The commission may require by commission order that any of the following strategies be implemented by the water supplier if the commission determines that the strategies are necessary in order for the conservation plan to be achieved:

- Conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates.

- A program to assist agricultural customers in the development of conservation pollution prevention and abatement plans.

- A program for reuse and/or recycling of wastewater and/or graywater.

- Any other water conservation practice, method, or technique which the wholesaler shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

Beginning May 1, 2005, the wholesale water supplier shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. A wholesale water supplier shall review and update the next revision of its water conservation plan no later than May 1, 2009, and every five years after that date to coincide with the Region H Water Planning Group regional water plan update.

6.1.6 Other Water Uses[5]

A water conservation plan for any other purpose or use not covered in this subchapter shall provide information where applicable about those practices, techniques, and technologies that will be used to reduce the consumption of water, prevent or reduce the loss or waste of water, maintain or improve the efficiency in the use of water, increase the recycling and reuse of water, or prevent the pollution of water.

[5] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30 Part 1 Chapter 288 Subchapter A Rule 288.6

6.2 Drought Contingency Plan[6]

Drought contingency plans can be required by the TCEQ/TWDB for certain applicants and water rights holders.

- The commission shall by rule require wholesale and retail public water suppliers and irrigation districts to develop drought contingency plans consistent with the appropriate approved regional water plan to be implemented during periods of water shortages and drought.

- The wholesale and retail public water suppliers and irrigation districts shall provide an opportunity for public input during preparation of their drought contingency plans and before submission of the plans to the commission.

Beginning in May 2005, the following are additional requirements in the drought contingency plan:

- Specific, quantified targets for water use reductions to be achieved during periods of water shortages and drought. The entity preparing the plan shall establish the targets.

- The commission and the board by joint rule shall identify quantified target goals for drought contingency plans that wholesale and retail public water suppliers, irrigation districts, and other entities may use as guidelines in preparing drought contingency plans. Goals established under this subsection are not enforceable requirements.

The commission and the board jointly shall develop model drought contingency programs for different types of water suppliers that suggest best management practices for accomplishing the highest practicable levels of water use reductions achievable during periods of water shortages and drought for each specific type of water supplier.

6.2.1 Municipal Uses by Public Water Suppliers[7]

Drought contingency plans for retail public water suppliers, where applicable, and for public water suppliers, must include the following minimum elements.

- Preparation of the plan shall include provisions to actively inform the public and affirmatively provide opportunity for public input. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting.

- Provisions shall be made for a program of continuing public education and information regarding the drought contingency plan.

[6] Model drought contingency plans specifically for Region H were developed for each water use category and are located at the end of this Chapter.
[7] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30 Part 1 Chapter 288 Subchapter A Rule 288.20

- The drought contingency plan must document coordination with the regional water planning groups for the service area of the retail public water supplier to ensure consistency with the appropriate approved regional water plans.

- The drought contingency plan must include a description of the information to be monitored by the water supplier and specific criteria for the initiation and termination of drought response stages, accompanied by an explanation of the rationale or basis for such triggering criteria.

- The drought contingency plan must include drought or emergency response stages providing for the implementation of measures in response to at least the following situations:

    - Reduction in available water supply up to a repeat of the drought of record.
    - Water production or distribution system limitations.
    - Supply source contamination.
    - System outage due to the failure or damage of major water system components (e.g., pumps).

- The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this subparagraph are not enforceable.

- The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following:

    - Curtailment of nonessential water uses.
    - Utilization of alternative water sources and/or alternative delivery mechanisms with the prior approval of the executive director as appropriate (e.g., interconnection with another water system, temporary use of a nonmunicipal water supply, use of reclaimed water for nonpotable purposes, etc.).

- The drought contingency plan must include the procedures to be followed for the initiation or termination of each drought response stage, including procedures for notification of the public.

- The drought contingency plan must include procedures for granting variances to the plan.

- The drought contingency plan must include procedures for the enforcement of mandatory water use restrictions, including specification of penalties (e.g., fines, water rate surcharges, discontinuation of service) for violations of such restrictions.

Privately owned water utilities shall prepare a drought contingency plan in accordance with this section and incorporate such plan into their tariff.

Any water supplier that receives all or a portion of its water supply from another water supplier shall consult with that supplier and shall include in the drought contingency plan appropriate provisions for responding to reductions in that water supply. A wholesale or retail water supplier shall notify the executive director within 5 business days of the implementation of any mandatory provisions of the drought contingency plan.

The retail public water supplier shall review and update, as appropriate, the drought contingency plan, at least every 5 years, based on new or updated information, such as the adoption or revision of the Region H Regional Water Plan.

6.2.2 Irrigation Uses[8]

A drought contingency plan for an irrigation use, where applicable, must include the following minimum elements. Drought contingency plans for irrigation water suppliers must include policies and procedures for the equitable and efficient allocation of water on a pro rata basis during times of shortage in accordance with *Texas Water Code, §11.039.*

- Preparation of the plan shall include provisions to actively inform and to affirmatively provide opportunity for users of water from the irrigation system to provide input into the preparation of the plan and to remain informed of the plan. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the water users and providing written notice to the water users concerning the proposed plan and meeting.

- The drought contingency plan must document coordination with the regional water planning groups to ensure consistency with the appropriate approved regional water plans.

- The drought contingency plan must include water supply criteria and other considerations for determining when to initiate or terminate water allocation procedures, accompanied by an explanation of the rationale or basis for such triggering criteria.

- The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this subparagraph are not enforceable.

- The drought contingency plan must include methods for determining the allocation of irrigation supplies to individual users.

- The drought contingency plan must include a description of the information to be monitored by the water supplier and the procedures to be followed for the initiation or termination of water allocation policies.

[8] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30 Part 1 Chapter 288 Subchapter A Rule 288.21

- The drought contingency plan must include procedures for use accounting during the implementation of water allocation policies.

- The drought contingency plan must include policies and procedures, if any, for the transfer of water allocations among individual users within the water supply system or to users outside the water supply system.

- The drought contingency plan must include procedures for the enforcement of water allocation policies, including specification of penalties for violations of such policies and for wasteful or excessive use of water.

- Wholesale water customers. Any irrigation water supplier that receives all or a portion of its water supply from another water supplier shall consult with that supplier, and shall include in the drought contingency plan appropriate provisions for responding to reductions in that water supply.

- Protection of public water supplies. Any irrigation water supplier that also provides or delivers water to a public water supplier(s) shall consult with that public water supplier(s) and shall include in the plan, mutually agreeable and appropriate provisions to ensure an uninterrupted supply of water necessary for essential uses relating to public health and safety. Nothing in this provision shall be construed as requiring the irrigation water supplier to transfer irrigation water supplies to non-irrigation use on a compulsory basis or without just compensation.

Irrigation water users shall review and update, as appropriate, the drought contingency plan at least every five years, based on new or updated information such as adoption or revision of the Region H Regional Water Plan.

6.2.3 Wholesale Water Providers[9]

A drought contingency plan for a wholesale water provider should include at a minimum the following information:

- Preparation of the plan shall include provisions to actively inform the public, to affirmatively provide opportunity for user input in the preparation of the plan, and for informing wholesale customers about the plan. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting.

- The drought contingency plan must document coordination with the Region H Regional Water Planning Group for the service area of the wholesale water provider to ensure consistency with the Region H Regional Water Plan.

- The drought contingency plan must include a description of the information to be monitored by the water supplier and specific criteria for the initiation and termination of

[9] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30 Part 1 Chapter 288 Subchapter A Rule 288.22

drought response stages, accompanied by an explanation of the rationale or basis for such triggering criteria.

- The drought contingency plan must include a minimum of three drought or emergency response stages providing for the implementation of measures in response to water supply conditions during a repeat of the drought-of-record.

- The drought contingency plan must include the procedures to be followed for the initiation or termination of drought response stages, including procedures for notification of wholesale customers regarding the initiation or termination of drought response stages.

- The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this paragraph are not enforceable.

- The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following:

    - Pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in *Texas Water Code, §11.039*; and

    - Utilization of alternative water sources with the prior approval of the executive director as appropriate (e.g., interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.).

- The drought contingency plan must include a provision in every wholesale water contract entered into or renewed after adoption of the plan, including contract extensions, that in case of a shortage of water resulting from drought, the water to be distributed shall be divided in accordance with *Texas Water Code, §11.039.*

- The drought contingency plan must include procedures for granting variances to the plan.

- The drought contingency plan must include procedures for the enforcement of any mandatory water use restrictions, including specification of penalties (e.g., liquidated damages, water rate surcharges, discontinuation of service) for violations of such restrictions.

The wholesale water provider shall notify the executive director within five business days of the implementation of any mandatory provisions of the drought contingency plan. The wholesale water provider shall review and update, as appropriate, the drought contingency plan at least every five years, based on new or updated information such as adoption or revision of the Region H Regional Water Plan.

Model Water Conservation Plan Template

Municipal Uses

Model Water Conservation Plan Template – Municipal Uses
Introduction and Background

Brief introduction describing WUG, its provided services, and general information.

1. Purpose

Purpose is to identify and establish principles, practices, and standards to effectively conserve and efficiently use available water supplies and water distribution system capacity.

Possibly provide historical annual average residential water demands and the goals for reductions in municipal demand included in the plan.

2. Location

General location of WUG and its service area

3. Customer Data

Population and Service Area Data

- Provide CCN certificate (if applicable) from TCEQ and service area map.
- Provide service area size in square miles.
- Provide current population of service area.
- Provide current population served by utility (water, wastewater, etc.).
- Provide population served by utility for previous five years.
- Provide projected population for service area for 2010, 2020, 2030, 2040, 2050.
- Provide source/method of calculating current and projected populations.

Active Connections

- Provide current number of active connections by user type and whether they are metered or not-metered (Metered Residential, Not-metered Residential, Metered Commercial, Not-metered Commercial, Metered Industrial, Not-metered Industrial, Metered Public, Not-metered Public, Metered Other, Not-metered Other).

- Provide net number of new connections/year for most recent three years by user type.

High Volume Customers

- Provide annual water use for five highest volume retail and wholesale customers indicating if treated or raw water delivery.

4. Water Use Data

Water Accounting Data

- Provide amount of water use monthly for previous five years in 1,000 gallons and indicate whether the water is raw water diverted or treated water distributed.
- Provide source/method of obtaining monthly water use for previous five years.
- Provide amount of water in 1,000 gallons delivered as recorded by user type (residential, commercial, industrial, wholesale, other).
- Provide previous five year records for unaccounted for water use.
- Provide previous five year records for annual peak-to-average daily use ratio.
- Provide municipal per capita water use for previous five years.
- Provide seasonal water use for previous five years (gpd).

Projected Water Demands

- Provide total water demand estimates for utility's planning horizon indicating data sources/methods for determining water demand.
- Discuss conservation measures already implemented, if any, including impacts of measures and methods of determination of impacts.

5. Water Supply System

Water Supply Sources

- Provide current water supply sources and amounts available for surface water, groundwater, contracts, and other.

Treatment and Distribution System

- Provide daily system capacity of treatment facilities.
- Provide storage capacity (elevated and ground).
- Provide description of water system including number of treatment plants, wells, storage tanks along with sketch or map of system.
- Provide estimates of time before additional facilities for supply, storage, and pumping will be needed without conservation measures.

6. Wastewater Utility System

Wastewater System Data

- Provide design capacity of wastewater treatment plant.
- Provide description of wastewater system in service area including TCEQ name, number of treatment plants, operator, owner, receiving stream of discharge if applicable.
- Provide sketch of plant and discharge point locations

Wastewater Data for Service Area

- Provide percent of water service area served by wastewater system.
- Provide monthly volume treated for previous three years.
- Provide quality information on treatment plant effluent for reuse applications.
- Determine ratio between treated water pumped and wastewater flow.

7. Utility Operating Data

Water and wastewater rates/ rate structure for all classes – provide list of rates

(Rates should be cost-based so that they do not promote the excessive use of water)

Other relevant data

8. Water Conservation Goals

Goals for municipal utilities established to maintain/reduce consumption measured in:

- Gallons per capita per day used
- Unaccounted for water uses
- Peak day to average day ratio
- Increase in reuse or recycling of water

TCEQ/TWDB will assess conservation goals based on whether the following is addressed:

- *Identification of a water/wastewater problem*
- *Completion of utility profile*
- *Selection of goals based on technical potential to save water as in utility profile*
- *Performance of cost-benefit analysis of strategies*

Complete following (in gpcd) to quantify conservation goals for utility's service area:

Estimation for reducing per capita water use:

- Reduction in unaccounted-for uses

- Reduction in indoor water use due to water-conserving plumbing fixtures
- Reduction in seasonal use
- Reduction in water use due to public education program

Planning goal (Specific quantified five and ten year targets for water savings to include goals for water loss programs and goals for municipal use, in gallons per capita day)

A schedule for implementing the plan to achieve the applicant's targets and goals

Needed reduction in per capita to meet planning goal

9. Water Conservation Plan Elements – Other Programs/BMPs That Should be Part of the Conservation Plan

Supplier:

A method for tracking the implementation and effectiveness of the plan

Metering Program

- A master meter(s) to measure and account for the amount of water diverted from the source of supply
- A program for universal metering of both customer and public uses of water, for meter testing and repair, and for periodic meter replacement)

Measures to Determine and Control Unaccounted for Water

- Measures to determine and control unaccounted-for uses of water (e.g., periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections, abandoned services, etc.)

Leak Detection and Repair (a program for leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system in order to control unaccounted-for uses of water)

Reservoir System Operating Plan

Customer:

Education Programs

- Media Campaign
- School Programs
- Public Exhibitions

Water Rate Structure

Examples of programs/BMPs that could be considered
Supplier:

- Plumbing and Landscape Ordinances
- Toilet Replacement/Rebates
- Clothes Washer Replacement/Rebates
- Hot-on-demand Rebate – circulating pumps installed to reduce water waste while waiting for the water to get warm
- Refrigerated Air Conditioning Cash Rebate
- Rain Barrel Rebate
- Rainwater Harvesting Program
- Efficient Irrigation Rebate

Customer:

- Reuse and Recycling of Wastewater and Graywater

10. Regional Water Planning and Coordination

Being located within Region H, a copy of this plan has been provided to the Region H Regional Water Planning Group.

11. Authority and Adoption

- Means of implementation and enforcement

Model Water Conservation Plan Template

Industrial and Mining Uses

Model Water Conservation Plan Template – Industrial and Mining Uses
Introduction and Background

Brief introduction describing WUG, its provided services, and general information.

1. Purpose

Purpose is to identify and establish principles, practices, and standards to effectively conserve and efficiently use available water supplies and water distribution system capacity.

Possibly provide historical annual average Industrial or Mining water demands and the goals for industrial or mining water demand reduction included in the plan. (The water conservation plan 5- and 10-year targets should be discussed in *Section 1.4 – Water Conservation Plan Goals*).

2. Location

General location of WUG and its service area

3. Water Use Data

Water Accounting Data

- Description of the use of the water in the production process, including how the water is diverted and transported from the source(s) of supply, how the water is utilized in the production process, and estimated quantity of water consumed in the production process and therefore unavailable for reuse, discharge, or other means of disposal.

Projected Water Demands

- Provide total water demand estimates for utility's planning horizon indicating data sources/methods for determining water demand.

- Discuss conservation measures already implemented, if any, including impacts of measures and methods of determination of impacts.

4. Water Conservation Goals

Planning goal (Specific quantified five and ten year targets for water savings to include goals for water loss programs and goals for industrial and mining uses).

A schedule for implementing the plan to achieve the applicant's targets and goals.

Needed reduction in gallons per day (gpd) to meet planning goal.

5. Water Conservation Plan Elements –Other Programs/BMPs that should be part of the conservation plan

A method for tracking the implementation and effectiveness of the plan

Metering Program

- A master meter(s) (accurate to within plus or minus 5 percent) to measure and account for the amount of water diverted from the supply source

Measures to Determine and Control Unaccounted for Water

- Measures to determine and control unaccounted-for uses of water (e.g., periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections, abandoned services, etc.)

Leak Detection and Repair (a program for leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system in order to control unaccounted-for uses of water)

List any application of state-of-the-art equipment and/or process modifications to improve water use efficiency

Examples of programs/BMPs that could be considered in achieving the conservation goals:

- Industrial Water Audit
- Industrial Water Waste Reduction
- Industrial Submetering
- Cooling Towers
- Cooling Systems (other than cooling towers)
- Industrial Alternative Sources and Reuse of Process Water
- Rinsing/Cleaning
- Water Treatment
- Boiler and Steam Systems
- Refrigeration (including chilled water)
- Once through Cooling
- Management and Employee Programs
- Industrial Landscape
- Industrial Site Specific Conservation

6. Regional Water Planning and Coordination

Beginning May 1, 2005, an industrial or mining water user shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The industrial or mining water user shall review and update the plan with the next revision of this water conservation plan coinciding with the Region H regional water planning process.

Model Water Conservation Plan Template
Agricultural Uses

Model Water Conservation Plan Template – Agricultural Uses
Introduction and Background

Brief introduction describing WUG, its provided services, and general information

1. Purpose

Purpose is to identify and establish principles, practices, and standards to effectively conserve and efficiently use available water supplies and water distribution system capacity.

Possibly provide historical annual average agricultural water demands and the goals for reduction in agricultural water demand included in the plan.

2. Location and General Information

General location of WUG and its service area

System Providing Agricultural Water to More Than One User

- System Inventory for the Suppliers facilities including water storage, conveyance, and delivery structures. Also discuss the operating practices and rules as well as water pricing policy. Accounting practices for the water should be briefly discussed.

- User profile including square miles of the service area, the number of customers taking delivery of water by the system, the types of crops, the types of irrigation systems, the types of drainage systems, and total acreage under irrigation, both historical and projected.

3. Water Use Data

Water Accounting Data

Agricultural User Other than Irrigation

- Description of the use of the water in the production process, including how the water diverted and transported from the source(s) of supply, how the water is utilized in the production process, and estimated quantity of water consumed in the production process and therefore unavailable for reuse, discharge, or other means of disposal.

Individual Irrigation User

- Description of the irrigation production process, including type of crops to be irrigated, monthly irrigation diversions, any seasonal or annual crop rotation, and soil types of the land to be irrigated.

- A description of the irrigation method or delivery system and equipment including pumps, flow rates, plans, and/or schematics of the system layout.

All Agricultural Users

Projected Water Demands

- Provide total water demand estimates for utility's planning horizon indicating data sources/methods for determining water demand

- Discuss conservation measures already implemented, if any, including impacts of measures and methods for determination of impacts.

4. Water Conservation Goals

All Agricultural Users

- Planning goal (Specific, quantified five-year and ten-year targets for water savings including, where appropriate, quantitative goals for irrigation/agricultural water use efficiency and a pollution abatement and prevention plan. The targets established by a water user under this section are not enforceable.

5. Water Conservation Plan Elements –Other Programs/BMPs That Should be Part of the Conservation Plan

All Agricultural Users

- A method for tracking the implementation and effectiveness of the plan
- Metering Program
    - A master meter(s) or other **device/method** (accurate to within +/- 5 percent) to measure and account for the amount of water diverted from the source of supply.

- Measures to Determine and Control Unaccounted for Water
    - Measures to determine and control unaccounted-for uses of water (e.g., periodic visual inspections along distribution lines and canals; annual or monthly audit of the water system to determine illegal connections, abandoned services, etc.)

- Leak Detection and Repair (a program for leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system in order to control unaccounted-for uses of water)

Agricultural User Other than Irrigation

- List any application of state-of-the-art equipment and/or process modifications to improve water use efficiency

- Any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

Individual Irrigation User

- Water-conserving irrigation equipment and application system or method including surge irrigation, low-pressure sprinkler, lining of on-farm irrigation ditches, and non-leaking pipe are a few examples of equipment to aid in conservation. List all conservation measures utilized to conserve water.
- Scheduling the timing and/or measuring the amount of water applied (e.g., soil moisture monitoring, etc.)
- Land improvements for retaining or reducing runoff, and increasing the infiltration of rain and irrigation water including, but not limited to, land leveling, furrow diking, terracing, and weed control
- Tailwater recovery and reuse
- Any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

System Providing Agricultural Water to more than one User

- Monitoring and record management program of water deliveries, sales, and loses.
- A program to assist customers in the development of on-farm water conservation and pollution prevention plans and/or measures.
- Any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan. Lining of district irrigation canals and replacement of canals with pipelines are a few examples of measures to aid in conservation.
- The customers of the agricultural water provider should also develop a water conservation plan or implement water conservation measures.

6. Regional Water Planning and Coordination

System Providing Agricultural Water to more than one User

- Beginning May 1, 2005, an agricultural water user shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The industrial or mining water user shall review and update the plan with the next revision of this water conservation plan coinciding with the regional water planning process.

7. Adoption of Plan

Official adoption of the water conservation plan and goals, by ordinance, rule, resolution, or tariff, indicating that the plan reflects official policy.

A review and update of this plan should occur in conjunction with the regional water planning groups update of the Region H Water Plan as well as modify the five and ten-year targets modified as necessary.

Model Water Conservation Plan Template
Wholesale Water Providers

Model Water Conservation Plan Template – Wholesale Water Providers
Introduction and Background

Brief introduction describing WWP, its provided services, and general information.

1. Purpose

Purpose is to identify and establish principles, practices, and standards to effectively conserve and efficiently use available water supplies and water distribution system capacity.

Possibly provide historical annual average residential water demands and the goals for reduction in water demands included in the plan.

2. Location

General location of WWP and its service area

3. Customer Data

Population and Service Area Data

- Provide CCN certificate from TCEQ and service area map
- Provide service area size in square miles
- Provide current population of service area
- Provide current population served by utility (water, wastewater, etc.)
- Provide population served by utility for previous five years
- Provide projected population for service area for 2010, 2020, 2030, 2040, 2050
- Provide source/method of calculating current and projected populations

Active Connections

- Provide current number of active connections by user type and whether they are metered or not-metered (Metered Residential, Not-metered Residential, Metered Commercial, Not-metered Commercial, Metered Industrial, Not-metered Industrial, Metered Public, Not-metered Public, Metered Other, Not-metered Other)

- Provide net number of new connections/year for most recent three years by user type

High Volume Customers

- Provide annual water use for five highest volume retail and wholesale customers indicating if treated or raw water delivery

4. Water Use Data

Water Accounting Data

- Provide amount of water use monthly for previous five years in 1,000 gallons and indicate whether the water is raw water diverted or treated water distributed
- Provide source/method of obtaining monthly water use for previous five years
- Provide amount of water in 1,000 gallons delivered as recorded by user type (residential, commercial, industrial, wholesale, other)
- Provide previous five year records for unaccounted for water use
- Provide previous five year records for annual peak-to-average daily use ratio
- Provide municipal per capita water use for previous five years
- Provide seasonal water use for previous five years (gpd)

Projected Water Demands

- Provide total water demand estimates for utility's planning horizon indicating data sources/methods for determining water demand
- Discuss conservation measures already implemented, if any, including impacts of measures and methods of determination of impacts.

5. Water Supply System

Water Supply Sources

- Provide current water supply sources and amounts available for surface water, groundwater, contracts, and other

Treatment and Distribution System

- Provide design daily system capacity
- Provide storage capacity (elevated and ground)
- Provide description of water system including number of treatment plants, wells, storage tanks along with sketch of system
- Provide estimates of time before additional facilities for supply, storage, and pumping will be needed without conservation measures.

6. Wastewater Utility System

Wastewater System Data

- Provide design capacity of wastewater treatment plant
- Provide description of wastewater system in service area including TCEQ name, number of treatment plants, operator, owner, receiving stream of discharge if applicable.
- Provide sketch of plant and discharge point locations

Wastewater Data for Service Area

- Provide percent of water service area served by wastewater system
- Provide monthly volume treated for previous three years
- Provide quality information on treatment plant effluent for reuse applications
- Determine ratio between treated water pumped and wastewater flow

7. Utility Operating Data

Water and wastewater rates/ rate structure for all classes – provide list of rates
(Rates should be cost-based so that they do not promote the excessive use of water)
Other relevant data

8. Water Conservation Goals

Goals for WWPs established to maintain/reduce consumption measured in

- Gallons per capita per day used
- Unaccounted for water uses
- Peak day to average day ratio
- Increase in reuse or recycling of water

TCEQ/TWDB will assess conservation goals based on whether the following is addressed:

- Identification of a water/wastewater problem
- Completion of utility profile
- Selection of goals based on technical potential to save water as in utility profile
- Performance of cost-benefit analysis of strategies

Complete following (in gpcd) to quantify conservation goals for WWP's service area:

- Estimation for reducing per capita water use:
    - Reduction in unaccounted-for uses
    - Reduction in indoor water use due to water-conserving plumbing fixtures
    - Reduction in seasonal use
    - Reduction in water use due to public education program
- Planning goal (Specific quantified five and ten year targets for water savings to include goals for water loss programs and goals for municipal use, in gallons per capita day)
- A schedule for implementing the plan to achieve the applicant's targets and goals
- Needed reduction in per capita to meet planning goal

9. Water Conservation Plan Elements – Other Programs/BMPs That Should be Part of the Conservation Plan

Supplier:

- A method for tracking the implementation and effectiveness of the plan
- Metering Program
    - A master meter(s) to measure and account for the amount of water diverted from the source of supply
- Measures to Determine and Control Unaccounted for Water
    - Measures to determine and control unaccounted-for uses of water (e.g., periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections, abandoned services, etc.)
- Leak Detection and Repair (a program for leak detection, repair, and water loss accounting for the water storage, delivery, and distribution system in order to control unaccounted-for uses of water)
- Reservoir System Operating Plan
    - Water Rate Structure (should be conservation oriented)

- Program to assist agricultural customers in the development of conservation pollution prevention and abatement plans.

- Program for Reuse and Recycling of Wastewater and Greywater (if not feasible explain why)

- Any other conservation measure which the WWP shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

10. Regional Water Planning and Coordination

11. Authority and Adoption

Means of implementation and enforcement

Model Drought Contingency Plan Template

Utility / Water Supplier

Model Drought Contingency Plan Template (Utility / Water Supplier)
Brief Introduction and Background

Include information such as

- Name of Utility
- Address, City, Zip Code
- CCN#
- PWS #s

Section 1 Declaration of Policy, Purpose, and Intent

In cases of extreme drought, periods of abnormally high usage, system contamination, or extended reduction in ability to supply water due to equipment failure, temporary restrictions may be instituted to limit nonessential water usage. The purpose of the Drought Contingency Plan (Plan) is to encourage customer conservation in order to maintain supply, storage, or pressure or to comply with the requirements of a court, government agency or other authority.

Water uses regulated or prohibited under this Drought Contingency Plan are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in *Section 6* of this plan.

(**Please note:** Water restriction is not a legitimate alternative if a water system does not meet the Texas Commission on Environmental Quality (TCEQ) capacity requirements under normal conditions **or** if the utility fails to take all immediate and necessary steps to replace or repair malfunctioning equipment.)

Section 2 Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the _____ (name of utility/water supplier) by means of _____ (describe methods used to inform the public about the preparation of the plan and provide opportunities for input; see below for examples)

- *Scheduling and providing public notice of a public meeting to accept input on the Plan*

  The meeting took place at:
  Date: _____
  Time: _____
  Location: _____

- *Mailed survey with summary of results* **(attach survey and results*)***
- *Bill insert inviting comment* **(attach bill insert)**
- *Other method*
  _____

Section 3 Public Education

_____ (*name of utility/name of supplier*) will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage.

Drought plan information will be provided by:
(Check at least one of the following)

- ❑ *Public meeting*
- ❑ *Press releases*
- ❑ *Utility bill inserts*
- ❑ *Other* _____

Section 4 Coordination with Regional Water Planning Groups

The service area of the _____ (*name of your utility/water supplier*) is located within Region H. _____ (*name of your utility/water supplier*) has mailed a copy of this Plan to the Region H Regional Water Planning Group.

Section 5 Notice Requirements

Written notice will be provided to each customer **prior to implementation or termination of each stage of the water restriction program**. Mailed notice must be given to each customer 72 hours prior to the start of water restriction. If notice is hand delivered, the utility cannot enforce the provisions of the plan for 24 hours after notice is provided. The written notice to customers will contain the following information:

the date restrictions will begin,

the circumstances that triggered the restrictions,

the stages of response and explanation of the restrictions to be implemented, and,

an explanation of the consequences for violations.

The utility must notify the TCEQ by telephone at (512) 239-4691, or electronic mail at *watermon@tceq.state.tx.us* prior to implementing Stage III and must notify in writing the Public Drinking Water Section at MC - 155, P.O. Box 13087, Austin, Texas 78711-3087 within five (5) working days of implementation including a copy of the utility's restriction notice. The utility must file a status report of its restriction program with the TCEQ at the initiation and termination of mandatory water use restrictions (i.e., Stages III and IV).

Section 6 Violations

First violation - The customer will be notified by written notice of their specific violation.

Subsequent violations:

After written notice, the utility may install a flow restricting device in the line to limit the amount of water which will pass through the meter in a 24-hour period. The utility may charge the customer for the actual cost of installing and removing the flow restricting device, not to exceed $50.00.

After written notice, the utility may discontinue service at the meter for a period of seven (7) days, or until the end of the calendar month, whichever is LESS. The normal reconnect fee of the utility will apply for restoration of service.

Section 7 Exemptions or Variances

The utility may grant any customer an exemption or variance from the drought contingency plan for good cause **upon written request**. A customer who is refused an exemption or variance may appeal such action of the utility in writing to the Texas Commission on Environmental Quality. The utility will treat all customers equally concerning exemptions and variances, and shall not discriminate in granting exemptions and variances. No exemption or variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Section 8 Response Stages

Unless there is an immediate and extreme reduction in water production, or other absolute necessity to declare an emergency or severe condition, the utility will initially declare Stage I restrictions. If, after a reasonable period of time, demand is not reduced enough to alleviate outages, reduce the risk of outages, or comply with restrictions required by a court, government agency or other authority, Stage II may be implemented with Stage III to follow if necessary.

STAGE I - CUSTOMER AWARENESS

Stage I will begin:

Every April 1st, the utility will mail a public announcement to its customers. No notice to TCEQ required.

Stage I will end:

Every September 30th, the utility will mail a public announcement to it's customers. No notice to TCEQ required.

Utility Measures:

This announcement will be designed to increase customer awareness of water conservation and encourage the most efficient use of water. A copy of the current public

announcement on water conservation awareness shall be kept on file available for inspection by the TCEQ.

Voluntary Water Use Restrictions:

Water customers are requested to voluntarily limit the use of water for nonessential purposes and to practice water conservation.

STAGE II - VOLUNTARY WATER CONSERVATION:

Target: Achieve a _____ percent reduction in _____ (example: total water use, daily water demand, etc.)

The water utility will implement Stage II when any one of the selected triggers is reached:

Supply-Based Triggers: (check at least one and fill in the appropriate value)

- ☐ Well level reaches _____ ft. mean sea level (m.s.l.)
- ☐ Overnight recovery rate reaches _____ ft.
- ☐ Reservoir elevation reaches _____ ft. (m.s.l.)
- ☐ Stream flow reaches _____ cfs at USGS gage # _____
- ☐ Wholesale supplier's drought Stage II _____
- ☐ Annual water use equals _____ % of well permit/Water Right/purchased water contract amount
- ☐ Other _____

Demand- or Capacity-Based Triggers: (check at least one and fill in the appropriate value)

- ☐ Drinking water treatment as % of capacity _____ %
- ☐ Total daily demand as % of pumping capacity _____ %
- ☐ Total daily demand as % of storage capacity _____ %
- ☐ Pump hours per day _____ hrs.
- ☐ Production or distribution limitations
- ☐ Other _____

Upon initiation and termination of Stage II, the utility will mail a public announcement to its customers. No notice to TCEQ required.

Requirements for Termination:

Stage II of the Plan may end when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage II, Stage I becomes operative.

Utility Measures:

Visually inspect lines and repair leaks on a daily basis. Monthly review of customer use records and follow-up on any that have unusually high usage.

Describe additional measures, if any, to be implemented directly by the utility to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, activation and use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

The second water source for _____ (*name of utility*) is:
(check one)

- ☐ Other well
- ☐ Inter-connection with other system
- ☐ Purchased water
- ☐ Other

_____

Voluntary Water Use Restrictions:

Restricted Hours: Outside watering is allowed daily, but only during periods specifically described in the customer notice; between 10:00 p.m. and 5:00 a.m. for example;

Restricted Days/Hours: Water customers are requested to voluntarily limit the irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems. Customers are requested to limit outdoor water use to **Mondays for water customers with a street address ending with the numbers 1, 2, or 3, Wednesdays for water customers with a street address ending with the numbers 4, 5, or 6, and Fridays for water customers with a street address ending with the numbers 7, 8, 9, or 0.** Irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet-filled bucket or watering can of five (5) gallons or less, or drip irrigation system; or
Other uses that waste water such as water running down the gutter.

STAGE III - MANDATORY WATER USE RESTRICTIONS:

Target: Achieve a _____ percent reduction in _____ (example: total water use, daily water demand, etc.)

The water utility will implement Stage III when any one of the selected triggers is reached:

Supply-Based Triggers: (check at least one and fill in the appropriate value)

- ☐ Well level reaches _____ ft. (m.s.l.)
- ☐ Overnight recovery rate reaches _____ ft.
- ☐ Reservoir elevation reaches _____ ft. (m.s.l.)
- ☐ Stream flow reaches _____ cfs at USGS gage # _____
- ☐ Wholesale supplier's drought Stage III

  _____
- ☐ Annual water use equals _____ % of well permit/Water Right/purchased water contract amount
- ☐ Other _____

Demand- or Capacity-Based Triggers: (check at least one and fill in the appropriate value)

- ☐ Drinking water treatment as % of capacity _____ %
- ☐ Total daily demand as % of pumping capacity _____ %
- ☐ Total daily demand as % of storage capacity _____ %
- ☐ Pump hours per day _____ hrs.
- ☐ Production or distribution limitations
- ☐ Other _____

Upon initiation and termination of Stage III, the utility will mail a public announcement to its customers. Notice to TCEQ required.

Requirements for Termination:

Stage III of the Plan may end when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage III, Stage II becomes operative.

Utility Measures:

Visually inspect lines and repair leaks on a regular basis. Flushing is prohibited except for dead end mains.

Describe additional measures, if any, to be implemented directly by the utility to manage limited water supplies and/or reduce water demand. Examples include: activation and use of an alternative supply source(s); use of reclaimed water for non-potable purposes; offering low-flow fixtures and water restrictors.

Mandatory Water Use Restrictions:

The following water use restrictions shall apply to all customers.

1. Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems **shall be limited to Mondays for water customers with a street address ending with the numbers 1, 2, or 3, Wednesdays for water customers with a street address ending with the numbers 4, 5, or 6, and Fridays for water customers with a street address ending with the numbers 7, 8, 9, or 0.** Irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet-filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

2. Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rinses. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public are contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

3. Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or "jacuzzi" type pool is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight.

4. Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

7. Use of water from hydrants or flush valves shall be limited to maintaining public health, safety, and welfare.

6. Use of water for the irrigation of golf courses, parks, and green belt area is prohibited except by hand-held hose and only on designated watering days between the hours 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight.

7. The following uses of water are defined as nonessential and are prohibited:

    a. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;

b. use of water to wash down buildings or structures for purposes other than immediate fire protection;

c. use of potable water for dust control;

d. flushing gutters or permitting water to run or accumulate in any gutter or street;

e. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and

f. any waste of water.

STAGE IV - CRITICAL WATER USE RESTRICTIONS:

Target: Achieve a _____ percent reduction in _____ (example: total water use, daily water demand, etc.)

The water utility will implement Stage IV when any one of the selected triggers is reached:

Supply-Based Triggers: (check at least one and fill in the appropriate value)

- ☐ Well level reaches _____ ft. (m.s.l.)
- ☐ Overnight recovery rate reaches _____ ft.
- ☐ Reservoir elevation reaches _____ ft. (m.s.l.)
- ☐ Stream flow reaches _____ cfs at USGS gage # _____
- ☐ Wholesale supplier's drought Stage IV _____
- ☐ Annual water use equals _____ % of well permit/Water Right/purchased water contract amount
- ☐ Supply contamination
- ☐ Other _____

Demand- or Capacity-Based Triggers: (check at least one and fill in the appropriate value)

- ☐ Drinking water treatment as % of capacity _____ %
- ☐ Total daily demand as % of pumping capacity _____ %
- ☐ Total daily demand as % of storage capacity _____ %
- ☐ Pump hours per day _____ hrs.
- ☐ Production or distribution limitations
- ☐ System outage
- ☐ Other _____

Upon initiation and termination of Stage IV, the utility will mail a public announcement to its customers. Notice to TCEQ required.

Requirements for Termination:

Stage IV of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage IV, Stage III becomes operative.

Operational Measures:

The utility shall visually inspect lines and repair leaks on a daily basis. Flushing is prohibited except for dead end mains and only between the hours of 9:00 p.m. and 3:00 a.m. Emergency interconnects or alternative supply arrangements shall be initiated. All meters shall be read as often as necessary to insure compliance with this program for the benefit of all the customers. *Describe additional measures, if any, to be implemented directly to manage limited water supplies and/or reduce water demand.*

Mandatory Water Use Restrictions: (all outdoor use of water is prohibited)

1. Irrigation of landscaped areas is absolutely prohibited.
2. Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

SYSTEM OUTAGE or SUPPLY CONTAMINATION

Notify TCEQ Regional Office immediately.

EXAMPLE RESOLUTION FOR ADOPTION OF A DROUGHT CONTINGENCY PLAN

RESOLUTION NO. _____

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE _____ (name of water supplier) ADOPTING A DROUGHT CONTINGENCY PLAN.

WHEREAS, the Board recognizes that the amount of water available to the _____ (name of water supplier) and its water utility customers are limited and subject to depletion during periods of extended drought;

WHEREAS, the Board recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the customers of the _____ (name of water supply system), the Board deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE _____ (name of water supplier):

SECTION 1. That the Drought Contingency Plan attached hereto as Exhibit "A" and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the _____ (name of water supplier).

SECTION 2. That the _____ (e.g., general manager) is hereby directed to implement, administer, and enforce the Drought Contingency Plan.

SECTION 3. That this resolution shall take effect immediately upon its passage.

DULY PASSED BY THE BOARD OF DIRECTORS OF THE _____, ON THIS __ day of _____, 20__.

_____

President, Board of Directors

ATTESTED TO:

_____

Secretary, Board of Directors

Model Drought Contingency Plan Template

Irrigation Uses

Model Drought Contingency Plan Template (Irrigation Uses)

DROUGHT CONTINGENCY PLAN
FOR
(Name of irrigation district)
(Date)

Section 1: Declaration of Policy, Purpose, and Intent
The Board of Directors of the _____ (name of irrigation district) deems it to be in the interest of the District to adopt Rules and Regulations governing the equitable and efficient allocation of limited water supplies during times of shortage. These Rules and Regulations constitute the District's drought contingency plan required under Section 11.1272, Texas Water Code, *Vernon's Texas Codes Annotated,* and associated administrative rules of the Texas Commission on Environmental Quality (Title 30, Texas Administrative Code, Chapter 288).

Section 2: User Involvement
Opportunity for users of water from the _____ (name of irrigation district) was provided by means of _____ (describe methods used to inform water users about the preparation of the plan and opportunities for input; for example, scheduling and providing notice of a public meeting to accept user input on the plan).

Section 3: User Education
The _____ (name of irrigation district) will periodically provide water users with information about the Plan, including information about the conditions under which water allocation is to be initiated or terminated and the district's policies and procedures for water allocation. This information will be provided by means of _____ (e.g. describe methods to be used to provide water users with information about the Plan; for example, by providing copies of the Plan and by posting water allocation rules and regulations on the district's public bulletin board).

Section 4: Authorization
The _____ (e.g., general manager) is hereby authorized and directed to implement the applicable provision of the Plan upon determination by the Board that such implementation is necessary to ensure the equitable and efficient allocation of limited water supplies during times of shortage.

Section 5: Application

The provisions for the Plan shall apply to all persons utilizing water provided by the _____ (name of irrigation district). The term "person" as used in the Plan includes individuals, corporations, partnerships, associations, and all other legal entities.

Section 6: Initiation of Water Allocation
The _____ (designated official) shall monitor water supply conditions on a _____ (e.g. weekly, monthly) basis and shall make recommendations to the Board regarding irrigation of water allocation. Upon approval of the Board, water allocation will become effective when _____ (describe the criteria and the basis for the criteria):

Below are examples of the types of triggering criteria that might be used; singly or in combination, in an irrigation district's drought contingency plan:

Example 1: Water in storage in the _____ (name of reservoir) is equal to or less than _____ (acre-feet and/or percentage of storage capacity).

Example 2: Combined storage in the _____ (name or reservoirs) reservoir system is equal to or less than _____ (acre-feet and/or percentage of storage capacity).

Example 3: Flows as measured by the U.S. Geological Survey gage on the _____ (name of reservoir) near _____, Texas reaches ____ cubic feet per second (cfs).

Example 4: The storage balance in the district's irrigation water rights account reaches _____ acre-feet.

Example 5: The storage balance in the district's irrigation water rights account reaches an amount equivalent to _____ (number) irrigations for each flat rate acre in which all flat rate assessments are paid and current.

Example 6: The _____ (name of entity supplying water to the irrigation district) notifies the district that water deliveries will be limited to _____ acre-feet per year (i.e. a level below that required for unrestricted irrigation).

Section 7: Termination of Water Allocation
The district's water allocation policies will remain in effect until the conditions defined in Section IV of the Plan no longer exist and the Board deems that the need to allocate water no longer exists.

Section 8: Notice
Notice of the initiation of water allocation will be given by notice posted on the District's public bulletin board and by mail to each _____ (e.g. landowner, holders of active irrigation accounts, etc.).

Section 9: Water Allocation
(a) In identifying **specific, quantified targets** for water allocation to be achieved during periods of water shortages and drought, each irrigation user shall be allocated _____ irrigations or _____ acre-feet of water each flat rate acre on which all taxes, fees, and charges have been paid. The water allotment in each irrigation account will be expressed in acre-feet of water.

Include explanation of water allocation procedure. For example, in the Lower Rio Grande Valley, an "irrigation" is typically considered to be equivalent to eight (8) inches of water per irrigation acre; consisting of six (6) inches of water per acre applied plus two (2) inches of water lost in transporting the water from the river to the land.

Thus, three irrigations would be equal to 24 inches of water per acre or an allocation of 2.0 acre-feet of water measured at the diversion from the river.

(b) As additional water supplies become available to the District in an amount reasonably sufficient for allocation to the District's irrigation users, the additional water made available to the District will be equally distributed, on a pro rata basis, to those irrigation users having _____.

Example 1: An account balance of less than _____ irrigations for each flat rate acre (i.e. ____ acre-feet_.

Example 2: An account balance of less than _____ acre-feet of water for each flat rate acre.

Example 3: An account balance of less than _____ acre-feet of water.
(c) The amount of water charged against a user's water allocation will be ____ (e.g. eight inches) per irrigation, or one allocation unit, unless water deliveries to the land are metered. Metered water deliveries will be charges based on actual measured use. In order to maintain parity in charging use against a water allocation between non-metered and metered deliveries, a loss factor of ____ percent of the water delivered in a metered situation will be added to the measured use and will be charged against the users water allocation. Any metered use, with the loss factor applied, that is less than eight (8) inches per acre shall be credited back to the allocation unit and will be available to the user. It shall be a violation of the Rules and Regulations for a water user to use water in excess of the amount of water contained in the users irrigation account. (d) Acreage in an irrigation account that has not been irrigated for any reason within the last two (2) consecutive years will be considered inactive and will not be allocated water. Any landowner whose land has not been irrigated within the last two (2) consecutive years, may, upon application to the District expressing intent to irrigate the land, receive future allocations. However, irrigation water allocated shall be applied only upon the acreage to which it was allocated and such water allotment cannot be transferred until there have been two consecutive years of use.

Section 10: Transfers of Allotments

(a) A water allocation in an active irrigation account may be transferred within the boundaries of the District from one irrigation account to another. The transfer of water can only be made by the landowner's agent who is authorized in writing to act on behalf of the landowner in the transfer of all or part of the water allocation from the described land of the landowner covered by the irrigation account.

(b) A water allocation may not be transferred to land owned by a landowner outside the District boundaries. **Or** A water allocation may be transferred to land outside the District's boundaries by paying the current water charge as if the water was actually delivered by the District to the land covered by an irrigation account. The amount of water allowed to be transferred shall be stated in terms of acre-feet and deducted from the landowner's current allocation balance in the irrigation account. Transfers

of water outside the District shall not affect the allocation of water under Section VII of these Rules and Regulations.

(c) Water from outside the District may not be transferred by a landowner for use within the District. **Or** Water from outside the District may be transferred by a landowner for use within the District. The District will divert and deliver the water on the same basis as District water is delivered, except that a ___ percent conveyance loss will be charged against the amount of water transferred for use in the District as the water is delivered.

Section 11: Penalties

Any person who willfully opens, closes, changes or interferes with any headgate or uses water in violation of these Rules and Regulations, shall be considered in violation of Section 11.0083, Texas Water Code, *Vernon's Texas Codes Annotated,* which provides for punishment by fine of not less than $10.00 nor more than $200.00 or by confinement in the county jail for not more than thirty (30) days, or both, for each violation, and these penalties provided by the laws of the State and may by enforced by complaints filed in the appropriate court jurisdiction in _____ County, all in accordance with Section 11.083; and in addition, the District may pursue a civil remedy in the way of damages and/or injunction against the violation of any of the foregoing Rules and Regulations.

Section 12: Severability

It is hereby declared to be the intention of the Board of Directors of the _____ (name of irrigation district) that the sections, paragraphs, sentences, clauses, and phrases of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the Board without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

Section 13: Authority

The foregoing rules and regulations are adopted pursuant to and in accordance with *Sections 11.039, 11.083, 11.1272; Section 49.004; and Section 58.127-130 of the Texas Water Code, Vernon's Texas Codes Annotated.*

Section 14: Effective Date of Plan

The effective date of this Rule shall be five (5) days following the date of Publication hereof and ignorance of the Rules and Regulations is not a defense for a prosecution for enforcement of the violation of the Rules and Regulations.

EXAMPLE RESOLUTION FOR ADOPTION OF A DROUGHT CONTINGENCY PLAN

RESOLUTION NO. _____

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE _____ (Name of water supplier) ADOPTING A DROUGHT CONTINGENCY PLAN. WHEREAS, the Board recognizes that the amount of water available to the _____ (name of water supplier) and its water utility customers is limited and subject to depletion during periods of extended drought; WHEREAS, the Board recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes; WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; And WHEREAS, as authorized under law, and in the best interests of the customers of the _____(name of water supply system), the Board deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE _____ (name of water supplier):

SECTION 1. That the Drought Contingency Plan attached hereto as Exhibit AA@ and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the _____ (name of water supplier).

SECTION 2. That the _____ (e.g., general manager) is hereby directed to implement, administer, and enforce the Drought Contingency Plan.

SECTION 3. That this resolution shall take effect immediately upon its passage.

DULY PASSED BY THE BOARD OF DIRECTORS OF THE _____, ON THIS __ day of _____, 20__.

_____
President, Board of Directors
ATTESTED TO:

_____
Secretary, Board of Directors

Model Drought Contingency Plan Template

Wholesale Water Providers

Model Drought Contingency Plan Template (**Wholesale Public Water Suppliers**)

DROUGHT CONTINGENCY PLAN
FOR THE
(Name of wholesale water supplier)
(Date)

Section 1: Declaration of Policy, Purpose, and Intent
In order to conserve the available water supply and/or to protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the _____ (name of water supplier) adopts the following Drought Contingency Plan (the Plan).

Section 2: Public Involvement
Opportunity for the public and wholesale water customers to provide input into the preparation of the Plan was provided by _____ (name of water supplier) by means of _____ (describe methods used to inform the public and wholesale customers about the preparation of the plan and opportunities for input; for example, scheduling and proving public notice of a public meeting to accept input on the Plan).

Section 3: Wholesale Water Customer Education
The _____ (name of water supplier) will periodically provide wholesale water customers with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of _____ (e.g., describe methods to be used to provide customers with information about the Plan; for example, providing a copy of the Plan or periodically including information about the Plan with invoices for water sales).

Section 4: Coordination with Regional Water Planning Groups
The water service area of the _____ (name of water supplier) is located within the _____ (name of regional water planning area or areas) and the _____ (name of water supplier) has provided a copy of the Plan to the _____ (name of regional water planning group or groups).

Section 5: Authorization
The _____ (designated official; for example, the general manager or executive director), or his/her designee, is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The _____, or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section 6: Application
The provisions of this Plan shall apply to all customers utilizing water provided by the _____ (name of supplier). The terms "person" and "customer" as used in the plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section 7: Triggering Criteria for Initiation and Termination of Drought Response Stages
The _____ (designated official), or his/her designee, shall monitor water supply and/or demand conditions on a (e.g., weekly, monthly) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan. Customer notification of the initiation or termination of drought response stages will be made by mail or telephone. The news media will also be informed.

The triggering criteria described below are based on:
_____
_____
(Provide a brief description of the rationale for the triggering criteria; for example, triggering criteria are based on a statistical analysis of the vulnerability of the water source under drought of record conditions).

(a) Stage 1 - Mild Water Shortage Conditions
Requirements for initiation – The _____ (name of water supplier) will recognize that a mild water shortage condition exists when_____(describe triggering criteria, see examples below).

Below are examples of the types of triggering criteria that might be used in a wholesale water supplier's drought contingency plan. One or a combination of such criteria may be defined for each drought response stage:

Example 1: Water in storage in the _____ (name of reservoir) is equal to or less than _____ (acre-feet and/or percentage of storage capacity).

Example 2: When the combined storage in the _____ (name of reservoirs) is equal to or less than _____ (acre-feet and/or percentage of storage capacity).

Example 3: Flows as measured by the U.S. Geological Survey gage on the _____ (name of river) near _____, Texas reaches ___ cubic feet per second (cfs).

Example 4: When total daily water demand equals or exceeds _____ million gallons for ___consecutive days or ____ million gallons on a single day.

Example 5: When total daily water demand equals or exceeds ___ percent of the safe operating capacity of _____ million gallons per day for ___consecutive days or ___ percent on a single day.

Requirements for termination - Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 30) consecutive days. The _____ (name of water supplier) will notify its wholesale customers and the media of the termination of Stage1 in the same manner as the notification of initiation of Stage 1 of the Plan.

(b) Stage 2 - Moderate Water Shortage Conditions
Requirements for initiation – The _____ (name of water supplier) will recognize that a moderate water shortage condition exists when_____(describe triggering criteria).

Requirements for termination - Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 30) consecutive days.

Upon termination of Stage 2, Stage 1 becomes operative. The _____ (name of water supplier) will notify its wholesale customers and the media of the termination of Stage 2 in the same manner as the notification of initiation of Stage 1 of the Plan.

(c) Stage 3 - Severe Water Shortage Conditions
Requirements for initiation – The _____ (name of water supplier) will recognize that a severe water shortage condition exists when_____(describe triggering criteria).

Requirements for termination - Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 30) consecutive days.

Upon termination of Stage 3, Stage 2 becomes operative. The _____ (name of water supplier) will notify its wholesale customers and the media of the termination of Stage 2 in the same manner as the notification of initiation of Stage 3 of the Plan.

(d) Stage 4 – Emergency Water Shortage Conditions
Requirements for initiation - The _____ (name of water supplier) will recognize that an emergency water shortage condition exists when_____(describe triggering criteria).

Example 1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or

Example 2. Natural or man-made contamination of the water supply source(s). Requirements for termination - Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 30) consecutive days. The _____ (name of water supplier) will notify its wholesale customers and the media of the termination of stage 4.

Section 8: Drought Response Stages
The _____ (designated official), or his/her designee, shall monitor water supply and/or demand conditions and, in accordance with the triggering criteria set forth in Section VI, shall determine that mild, moderate, or severe water shortage conditions exist or that an emergency condition exists and shall implement the following actions:

Stage 1 - Mild Water Shortage Conditions

Target: Achieve a voluntary ___ percent reduction in _____ (e.g., total water use, daily water demand, etc.).

Best Management Practices for Supply Management:
Describe measures, if any, to be implemented directly by _____ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples

include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The _____ (designated official), or his/her designee(s), will contact wholesale water customers to discuss water supply and/or demand conditions and will request that wholesale water customers initiate voluntary measures to reduce water use (e.g., implement Stage 1 of the customer's drought contingency plan).

(b) The _____ (designated official), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 2 - Moderate Water Shortage Conditions

Target: Achieve a ___ percent reduction in _____ (e.g., total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe measures, if any, to be implemented directly by _____ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The _____ (designated official), or his/her designee(s), will initiate weekly contact with wholesale water customers to discuss water supply and/or demand conditions and the possibility of pro rata curtailment of water diversions and/or deliveries.

(b) The _____ (designated official), or his/her designee(s), will request wholesale water customers to initiate mandatory measures to reduce non-essential water use (e.g., implement Stage 2 of the customer's drought contingency plan).

(c) The _____ (designated official), or his/her designee(s), will initiate preparations for the implementation of pro rata curtailment of water diversions and/or deliveries by preparing a monthly water usage allocation baseline for each wholesale customer according to the procedures specified in Section VI of the Plan.

(d) The _____ (designated official), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 3 - Severe Water Shortage Conditions

Target: Achieve a ___ percent reduction in _____ (e.g., total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe measures, if any, to be implemented directly by _____ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The _____ (designated official), or his/her designee(s), will contact wholesale water customers to discuss water supply and/or demand conditions and will request that wholesale water customers initiate additional mandatory measures to reduce non-essential water use (e.g., implement Stage 2 of the customer's drought contingency plan).

(b) The _____ (designated official), or his/her designee(s), will initiate pro rata curtailment of water diversions and/or deliveries for each wholesale customer according to the procedures specified in Section VI of the Plan.

(c) The _____ (designated official), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 4 – Emergency Water Shortage Conditions

Whenever emergency water shortage conditions exist as defined in Section VII of the Plan, the _____ (designated official) shall:

1. Assess the severity of the problem and identify the actions needed and time required to solve the problem.

2. Inform the utility director or other responsible official of each wholesale water customer by telephone or in person and suggest actions, as appropriate, to alleviate problems (e.g., notification of the public to reduce water use until service is restored).

3. If appropriate, notify city, county, and/or state emergency response officials for assistance.

4. Undertake necessary actions, including repairs and/or clean-up as needed.

5. Prepare a post-event assessment report on the incident and critique of emergency response procedures and actions.

Section 9: Pro Rata Water Allocation
In the event that the triggering criteria specified in Section VII of the Plan for Stage 3 – Severe Water Shortage Conditions have been met, the _____ (designated official) is hereby authorized initiate allocation of water supplies on a pro rata basis in accordance with Texas Water Code Section 11.039.

Section 10: Enforcement
During any period when pro rata allocation of available water supplies is in effect, wholesale customers shall pay the following surcharges on excess water diversions and/or deliveries:

____ Times the normal water charge per acre-foot for water diversions and/or deliveries in excess of the monthly allocation up through 5 percent above the monthly allocation.

____ Times the normal water charge per acre-foot for water diversions and/or deliveries in excess of the monthly allocation from 5 percent through 10 percent above the monthly allocation.

____ Times the normal water charge per acre-foot for water diversions and/or deliveries in excess of the monthly allocation from 10 percent through 15 percent above the monthly allocation.

____ Times the normal water charge per acre-foot for water diversions and/or deliveries more than 15 percent above the monthly allocation.

The above surcharges shall be cumulative.

Section 11: Variances
The _____ (designated official), or his/her designee, may, in writing, grant a temporary variance to the pro rata water allocation policies provided by this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the public health, welfare, or safety and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use. Persons requesting an exemption from the provisions of this Plan shall file a petition for variance with the _____ (designated official) within 5 days after pro rata allocation has been invoked.

All petitions for variances shall be reviewed by the _____ (governing body), and shall include the following:

(a) Name and address of the petitioner(s).

(b) Detailed statement with supporting data and information as to how the pro rata allocation of water under the policies and procedures established in the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.

(c) Description of the relief requested.

(d) Period of time for which the variance is sought.

(e) Alternative measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.

(f) Other pertinent information.

Variances granted by the _____ (governing body) shall be subject to the following conditions, unless waived or modified by the _____ (governing body) or its designee: (a) Variances granted shall include a timetable for compliance. (b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements. No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Section 12: Severability

It is hereby declared to be the intention of the _____ (governing body of water supplier) that the sections, paragraphs, sentences, clauses, and phrases of this Plan are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the _____ (governing body of the water supplier) without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

EXAMPLE ORDINANCE FOR ADOPTION OF A DROUGHT CONTINGENCY PLAN ORDINANCE NO. _____

AN ORDINANCE OF THE CITY OF _____, TEXAS, ADOPTING A DROUGHT CONTINGENCY PLAN; ESTABLISHING CRITERIA FOR THE INITIATION AND TERMINATION OF DROUGHT RESPONSE STAGES; ESTABLISHING RESTRICTIONS ON CERTAIN WATER USES; ESTABLISHING PENALTIES FOR THE VIOLATION OF AND PROVISIONS FOR ENFORCEMENT OF THESE RESTRICTIONS; ESTABLISHING PROCEDURES FOR GRANTING VARIANCES; AND PROVIDING SEVERABILITY AND AN EFFECTIVE DATE. WHEREAS, the City of _____, Texas recognizes that the amount of water available to the City and its water utility customers is limited and subject to depletion during periods of extended drought; WHEREAS, the City recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes; WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and WHEREAS, as authorized under law, and in the best interests of the citizens of_____, Texas, the _____ (governing body) deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT ORDAINED BY THE CITY OF _____, TEXAS:

SECTION 1. That the City of _____, Texas Drought Contingency Plan attached hereto as Exhibit "A" and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the City.

SECTION 2. That all ordinances that are in conflict with the provisions of this ordinance be, and the same are hereby, repealed and all other ordinances of the City not in conflict with the provisions of this ordinance shall remain in full force and effect.

SECTION 3. Should any paragraph, sentence, subdivision, clause, phrase, or section of this ordinance be adjudged or held to be unconstitutional, illegal or invalid, the same shall not affect the validity of this ordinance as a whole or any part or provision thereof, other than the part so declared to be invalid, illegal or unconstitutional. SECTION 4. This ordinance shall take effect immediately from and after its passage and the publication of the caption, as the law in such cases provides. DULY PASSED BY THE CITY OF _____, TEXAS, on the _____ day of _____, 20__.

APPROVED:

_____
MAYOR

ATTESTED TO:

_____
CITY SECRETARY

APPROVED AS TO FORM:

_____
CITY ATTORNEY

EXAMPLE RESOLUTION FOR ADOPTION OF A DROUGHT CONTINGENCY PLAN
RESOLUTION NO. _____

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE _____ (name of water supplier) ADOPTING A DROUGHT CONTINGENCY PLAN. WHEREAS, the Board recognizes that the amount of water available to the _____ (name of water supplier) and its water utility customers is limited and subject to depletion during periods of extended drought; WHEREAS, the Board recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes; WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and WHEREAS, as authorized under law, and in the best interests of the customers of the _____(name of water supply system), the Board deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies; NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE _____ (name of water supplier):

SECTION 1. That the Drought Contingency Plan attached hereto as Exhibit AA@ and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the _____ (name of water supplier).

SECTION 2. That the _____ (e.g., general manager) is hereby directed to implement, administer, and enforce the Drought Contingency Plan.

SECTION 3. That this resolution shall take effect immediately upon its passage.
DULY PASSED BY THE BOARD OF DIRECTORS OF THE _____, ON THIS __ day of _____, 20__.

_____
President, Board of Directors

ATTESTED TO:

_____
Secretary, Board of Directors

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7. Long-Term Protection of the State's Water Resources, Agricultural Resources and Natural Resources

The Region H Water Planning Group balanced meeting water needs with good stewardship of the water, agricultural and natural resources within the region. The RHWPG recommended water conservation as the first strategy applied to meet every projected shortage. In the strategy selection process, the yield and environmental impact of projects were given greater consideration than the unit cost of water.

In this plan, existing in-basin supplies are fully utilized prior to recommending new water supply projects or interbasin transfers. In the new interbasin transfer strategies, only the minimum amount of water supply required to meet the projected demands is recommended. Wastewater reuse is a recommended strategy in Harris County as an alternative to the importation of additional water supplies.

The RHWPG believes that local groundwater conservation districts are best-suited to manage groundwater resources in which the individual districts have the responsibility to regulate. This plan recommends using groundwater up to the local sustainable yield, or the more restrictive limit established under subsidence district regulations, to meet local demands, but does not recommend the exportation of groundwater from its county of origin.

The affects of the recommended water management strategies on specific resources are discussed in further detail within this chapter.

7.1 Water Resources within Region H

Water resources available by basin within Region H are discussed in further detail below.

7.1.1 Neches-Trinity Coastal Basin

The Neches-Trinity Coastal Basin has numerous creeks and bayous which flow into East Bay. Many of these creeks and bayous provide water for irrigation and it is expected that this irrigation use will continue. Additional supplies are transferred into the Neches-Trinity Basin by the Lower Neches Valley Authority (water from the Sam Rayburn Reservoir – B.A. Steinhagen Lake System) and by the Chambers-Liberty Counties Navigation District (CLCND)(water from the Trinity River). This plan recommends increasing the transfer of water from the Trinity to meet the projected demands, which will affect the return flows location within Galveston Bay. No other impacts by these strategies are foreseen.

Groundwater supplies within the Neches-Trinity Basin come from the Gulf Coast Aquifer. The plan reflects using but not exceeding the sustainable yield of the aquifer in this basin.

7.1.2 Trinity River Basin

The Trinity River serves both Regions C and H. Within Region H, the Lake Livingston-Wallisville Saltwater Barrier System represents one half of the available surface water supply. This plan recommends using approximately 90% of the firm yield of this system, in addition to the full use of all water rights below the Lake. Achieving the full yield of Lake Livingston is dependent upon return flows from the upper basin. Region C is recommending wastewater reuse as a water management strategy (WMS) in the upper basin, which may limit these flows, but is also recommending the import of new supplies into the upper basin.

In combination, the upper basin strategies should have a neutral effect on the Lake Livingston supply.

This plan recommends transferring much of the Trinity River supply west into the adjacent coastal basin and the San Jacinto Basin. This will result in decreased flows in the lower Trinity Basin during drought periods. Senior water rights below Lake Livingston are protected by the lakes operating rules. Return flows from these transfers will still reach Galveston Bay, but will return via the San Jacinto basin.

Groundwater in the lower Trinity Basin predominantly comes from the Gulf Coast Aquifer as well as from the Carrizo-Wilcox, the Sparta, the Queen City and the Yegua-Jackson Aquifers. The plan reflects using but not exceeding the sustainable yield of the Gulf Coast Aquifer in this area. In addition, the other aquifers are only used to meet local demands. The export of groundwater from its source county is not recommended in this plan.

7.1.3 Trinity-San Jacinto Coastal Basin

The Trinity-San Jacinto Coastal Basin is relatively small, with Cedar Creek the most significant stream. There are several surface water rights for irrigation within the basin along with a substantial saline water right for cooling water from Galveston Bay. Both of these uses are expected to continue throughout the planning period. This plan recommends increasing the transfer of water from the Trinity River to meet the projected demands, which will affect the return flows location within Galveston Bay. No other impacts from the transfers are foreseen.

The groundwater supply source within this basin is the Gulf Coast Aquifer. The plan reflects using but not exceeding the sustainable yield of the aquifer in this basin. In Harris County, the Harris-Galveston Coastal Subsidence District regulations further restrict the use of groundwater to address land subsidence. These groundwater pumpage restrictions are reflected in the plan.

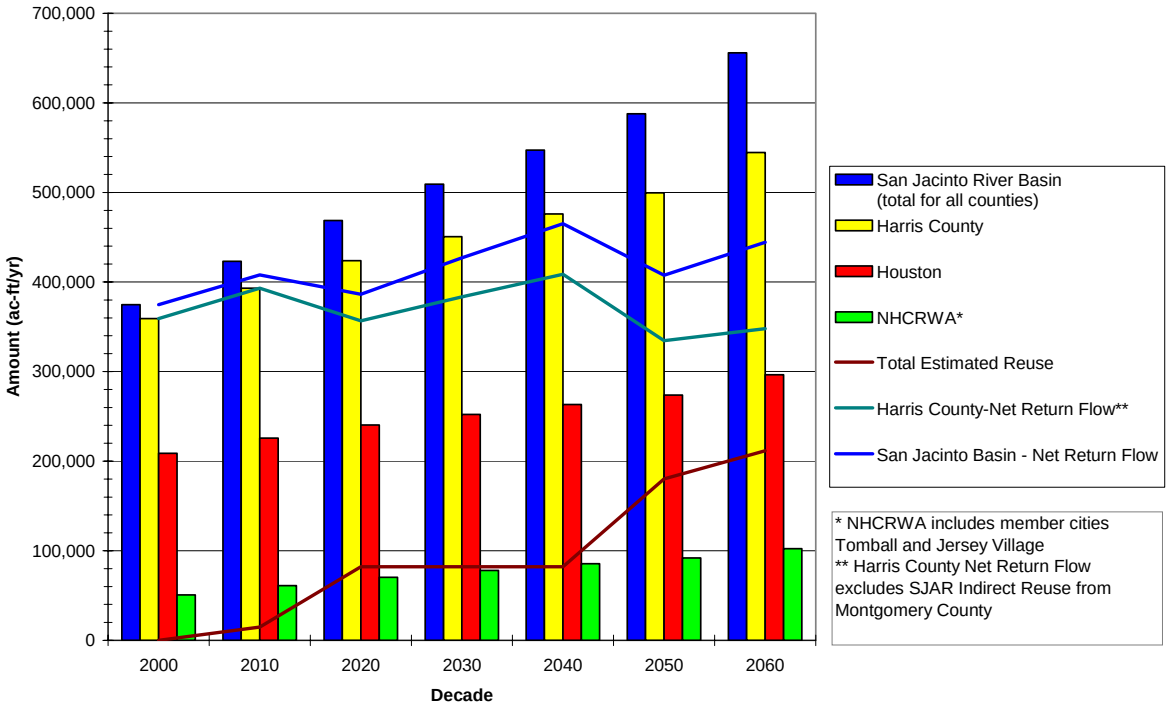
7.1.4 San Jacinto River Basin

The San Jacinto River Basin contains Lakes Houston and Conroe. These reservoirs make up approximately one tenth of the total surface water available in the region. This plan recommends fully utilizing the yield of these reservoirs and other surface water rights within the San Jacinto Basin. In addition, the plan calls for the interbasin transfer of supply from the Trinity River to meet projected demands. Full use of the existing water rights will reduce stream flows during drought conditions. However, this will be mitigated by increased return flows and return flows from imported supply.

Wastewater reuse is a recommended water management strategy in Harris County. An estimate of municipal return flows throughout the planning period is shown in Figure 7-1, below, and detailed in Appendix 7D. Direct reuse for industry is recommended to begin by year 2020. This will consume all new return flows, holding flows into the San Jacinto River and Upper Galveston Bay at the year 2000 level. The impact of initially diverting this reuse supply will be mitigated by tidal effects in the stream segment where the water is currently discharged. Additionally, the brine produced by the additional treatment process will be discharged into the Houston Ship Channel. This will be a deep discharge into the dredged channel and will not directly mix with the upper freshwater layer. Indirect wastewater reuse

is recommended to begin as early as year 2040. Municipal water demand in Harris County is expected to almost double during the planning period, and the recommended reuse volume is 20% of the potential available discharge. This indirect reuse is not expected to be implemented all at once, but rather as a series of small projects over several decades. Therefore, no shock affect of a new large diversion will be realized, and return flows will again remain near the year 2000 levels.

Figure 7-1: Estimated Municpal Return Flows and Reuse



The groundwater supply source in San Jacinto Basin is the Gulf Coast Aquifer. The current regional water plan reflects using but not exceeding the sustainable yield of the aquifer in this basin. In Harris County, the Harris-Galveston Coastal Subsidence District regulations further restrict the use of groundwater to address land subsidence. These groundwater pumpage restrictions are reflected in the plan.

7.1.5 San Jacinto-Brazos Coastal Basin

The San Jacinto-Brazos Coastal Basin encompasses all of Galveston County, most of Brazoria County, and portions of Harris and Fort Bend Counties. The coastal basin contains numerous streams and bayous which flow into Galveston Bay and West Bay. Major bayous contributing to Galveston Bay include Clear Creek, Dickinson Bayou and Chocolate Bayou. Bastrop Bayou, located at the western edge of the basin, flows into Christmas Bay. There are numerous surface water rights for irrigation, mining and manufacturing within the basin and these uses are expected to continue throughout the planning period. Water from the Brazos River is transferred into the coastal basin to meet current demands. The Gulf Coast Water Authority (GCWA) and the Chocolate Bayou Water Company maintain and operate canals and off-channel reservoirs within the coastal basin.

This plan recommends increasing the transfer of water from the Brazos to meet the projected growth in demands of Brazoria and Galveston Counties, which will increase the return flows to Galveston Bay. Also recommended is a transfer from the City of Houston to Galveston County, which would allow the GCWA to reallocate a portion of their Brazos River supply to Fort Bend County. This would not affect the total use and return flows within Galveston County, but would reduce the amount transferred from the Brazos basin. Finally, seawater desalination is recommended within Brazoria County. This will meet a portion of the demands and will potentially increase stream flows, since the return flows from desalination are not associated with a diversion from the source streams. No other surface water impacts are foreseen.

The groundwater supply source in San Jacinto Basin is the Gulf Coast Aquifer. The plan reflects using but not exceeding the sustainable yield of the aquifer in this basin. In Fort Bend, Galveston and Harris Counties, regulations enacted by the Fort Bend Subsidence District and the Harris-Galveston Coastal Subsidence District further restrict the use of groundwater to address land subsidence. These groundwater pumpage regulations are reflected in the plan.

7.1.6 Brazos River Basin

The Brazos River Basin is the second largest basin in the state (after the Rio Grande), primarily serving Regions O, G and H. The Brazos River Authority operates a system of reservoirs within the middle and upper basin, which provide a portion of the lower basin supply. There are also numerous water rights on the Brazos River and its tributaries which provide water for municipal, manufacturing, irrigation, mining and steam electric power uses. This plan recommends full use of the existing water rights in the lower basin as well as developing new sources of supply.

The Brazos River Authority has identified additional yield that can be realized by operating their reservoirs as a system. This strategy would allow the Brazos River Authority to divert interruptible flows to meet customer needs when these flows are available in lieu of releasing water from reservoir storage. During drought periods, more stored water would then be available, thus increasing the total yield of the Brazos River Authority reservoir system. This WMS will reduce the peak flows in the lower Brazos due to the increase in diversions. However, when base flows are below the median value, the BRA would release flows to meet customer demands. This would result in increased flows in the river segments above the customer diversion points, and should have no effect below those diversions.

Two new off-channel reservoirs are recommended in this plan. Allens Creek Reservoir, which is located in Austin County, would divert flows from the Brazos River. Little River Reservoir, located in Milam County, would divert flows from the Little River. Both of these projects would divert peak flows when the source stream is above a set base flow. This will reduce the net flow within the basin, but the impacts during drought or seasonal low flow periods would be limited.

As discussed in the San Jacinto-Brazos coastal basin description, above, seawater desalination is recommended in Brazoria County, as part of the Governor's demonstration project initiative. This will meet a portion of the municipal and manufacturing demands within the lower basin, and may be expanded in the future to meet increased municipal

demands. The increase in return flows from this source will mitigate, but not remedy, the reduction in base flows due to full use of water rights in the basin.

To protect water quality in the lower Brazos basin, particularly at the diversion points serving the southwestern portion of Brazoria County, the construction of a saltwater barrier is recommended. The Brazos River is the only river basin in Region H not protected from the seasonal tidal influence of saltwater by a saltwater barrier or other impoundment structure. Basin salinity modeling performed by the TWDB has shown that the saltwater influence will move further upstream under full use of water rights. This project will mitigate that effect and still allow flows to pass into the small Brazos River estuary.

Groundwater within this basin predominantly comes from the Gulf Coast Aquifer, as well as the Carrizo-Wilcox, the Brazos Alluvium, the Sparta and the Queen City Aquifers. The plan reflects using but not exceeding the sustainable yield of the Gulf Coast and Brazos Alluvium Aquifers in this area. The Carrizo-Wilcox, the Sparta and the Queen City Aquifers are only used to meet local demands. The export of groundwater from its source county is not recommended in this plan. In Fort Bend County, regulations enacted by the Fort Bend Subsidence District further restrict the use of groundwater from the Gulf Coast Aquifer to address land subsidence. These regulations are reflected in the plan.

7.1.7 Brazos-Colorado Coastal Basin

The Brazos-Colorado Coastal Basin contains the San Bernard River and its tributary streams. There are several surface water rights along the San Bernard River for manufacturing and irrigation uses. Both of these uses are expected to continue. However, there is a surplus in manufacturing water available. This plan recommends allocating a portion of the manufacturing surplus to meet the mining demand within the coastal basin. The remaining surplus of manufacturing water will remain with the water right holder. Municipal demands are supplied surface water from the Brazos River. No net change to the basin flows are expected.

The groundwater supply source in San Jacinto Basin is the Gulf Coast Aquifer. The plan reflects using but not exceeding the sustainable yield of the aquifer in this basin.

7.2 Agricultural Resources within Region H

Region H has approximately 4,000,000 acres of land in farms, with about one third of that land in production during any given year. Although this has remained constant over the past two decades, the crops and water usage within those farms has changed. Sugar Land is no longer surrounded by its namesake cane fields, and the Imperial Sugar Mill in that town closed its doors in 2004.

Data from the USDA Census of Agriculture is provided in Appendix 7A. The data shows that since 1987, irrigated acreage within Region H has declined by 26%. This decline is driven by economic factors, but the cost of water is among them. Rice, which is the most water-intensive crop raised in the region, has declined in price in recent years. Therefore, the rice price reduction has driven the reduction in irrigation. A rise in price could easily halt the decline in the irrigation demand.

Additionally, the region has approximately 1.55 million acres of productive timberland. This has declined by approximately 36,000 acres over the past decade. Rural land data obtained

from the Texas Cooperative Extension at Texas A&M University is also provided in Appendix 7A. It indicates that rural land use is increasing in the northern portion of the region, while decreasing in Montgomery and the southern counties due to urbanization. In many counties, native rangeland is being converted to improved, non-irrigated pasture.

This plan holds the projected irrigation demand fairly constant over the planning period, declining from 463,000 acre-feet per year in 2000 to 430,000 acre-feet per year in 2060 (a change of under 10 percent, and consistent with the observed development patterns in the southern half of the region). Region H is able to meet those demands from a combination of existing supplies, conservation, and the BRA System Operations WMS. The BRA Systems Operation WMS is the least costly of the new supply options. The need for financial assistance to realize the conservation goal is addressed in Chapter 8 under legislative recommendations.

7.3 Natural Resources within Region H

Region H contains many natural resources, and the WMS recommended in this plan are intended to protect those resources while still meeting the projected water needs of the region. The impacts of recommended strategies on specific resources are discussed below.

7.3.1 Threatened and Endangered Species

Region H has abundant habitat areas within the Sam Houston National Forest, the Big Thicket Nature Preserve, several National Wildlife Refuges, and significant undeveloped areas. Numerous native and migratory species live within these habitats, including over ten threatened and endangered aquatic species (listed in Appendix 7B).

The water management strategies (WMS) recommended in this water plan will have some impacts upon wetlands habitats, but the impacts are reduced from the 2001 plan. In the 2001 Region H Water Plan, three new reservoir projects were recommended. Two of those projects, Bedias and Little River, were main-stem reservoirs which would affect bottomland hardwood areas. In the current plan, the introduction of new WMS allowed the replacement of these projects on the recommendations list, although both remain viable alternatives for future consideration. Little River Reservoir was replaced with a combination of system operations of the BRA System, and an off-channel reservoir within the Little River watershed. This off-channel reservoir still has the potential to impact wetlands habitat, as does Allens Creek Reservoir, which is also in the plan. However, the potential impacts at these proposed sites are less than on the main stem of a river. At the Little River site in Milam County, habitats for the Houston Toad and Interior Least Tern may be inundated and require mitigation. At the Allens Creek site in Austin County, habitats for the White-faced Ibis, Wood Stork and Houston Toad may be inundated and require mitigation. It should be pointed out that the Allens Creek project was modified by the project sponsor to avoid impacting Alligator Hole, a wetland segment adjacent to the project site.

The transfer of supply from Lake Livingston into the San Jacinto basin is recommended in this plan. While the recommended amount is less than the full yield of the reservoir, it will still impact the lake level during dry periods and those wetlands along the periphery of the reservoir. Habitats for the Wood Stork and Alligator Snapping Turtle may be affected during drought periods, but no permanent impacts to these habitats are foreseen.

The recommended conveyance for transfers from the Trinity to the San Jacinto basin is the Luce Bayou Transfer. This project includes a pump station, pipeline, canal and finally the use of the bed and banks of Luce Bayou to move water into Lake Houston. Adding flow to Luce Bayou may inundate seasonal wetlands, and has the potential to cause backwater effects in Creek Chubsucker habitats. However, this project will not begin flowing at full capacity at inception. Initial flows will be within the normal range of flows in the bayou. As these flows are increased over time, the peripheral wetlands should naturally migrate with the waters edge.

Texas Parks and Wildlife Department Resource Protection Division prepared an evaluation of the WMS considered in the 2001 Region H Plan. That assessment addresses terrestrial species as well as the aquatic species addressed above, and is included at Appendix 7C.

7.3.2 Parks and Public Lands

As described in Chapter 1, Region H contains over 325,000 acres of state and national forests, over 107,000 acres of coastal wildlife refuges, and over 12,000 acres of Texas wildlife management areas. The RHWPG was fortunate that none of the recommended strategies required water supply projects within or conveyances through these areas. The transfer of supply from Lake Livingston into the San Jacinto basin has the potential to reduce flows through the Trinity River National Wildlife Refuge during drought periods. No other direct impacts of the plan are foreseen.

7.3.3 Impacts of Water Management Strategies on Unique Stream Segments

Region H recommended six stream segments for designation as unique in the 2001 Water Plan. The streams recommended were:

- Armand Bayou in Harris County
- Bastrop Bayou in Brazoria County
- Big Creek in Fort Bend County
- Big Creek in San Jacinto County
- Cedar Lake Creek in Brazoria County
- Menard Creek in Polk and Liberty Counties

All of these segments occur within riparian conservation areas, and there are no water management strategies that divert additional water from or above these streams. Additionally, terrestrial strategies such as brush control or salt cedar removal are not recommended within Region H, so the riparian habitats should not be affected. Finally, there is some concern that overuse of groundwater would impact spring flows within the Sam Houston National Forest. Region H does not recommend the export of groundwater from any county, and encourages the formation of groundwater conservation districts to actively manage these resources. The western portion of the National Forest lies in Walker and Montgomery Counties, which both have active groundwater conservation districts. The southern portion of the National Forest is in San Jacinto and Liberty Counties, which are currently working towards forming a groundwater conservation district.

The current recommendations for stream segments to be designated as unique are in Chapter 8.

7.3.4 Impacts of Water Management Strategies on Galveston Bay

The Galveston Bay estuary is arguably the most significant natural resource within Region H, providing habitat for a rich diversity of permanent and migratory species, recreational and tourism use, employment for fisherman and the tourism industry, and serves as the gateway to the second busiest port in the U.S.

As discussed in Chapter 4.5, Galveston Bay is affected by the water plans for both Region C (in the Upper Trinity River Basin) and for Region H (in the Lower Trinity and San Jacinto River Basins. The Galveston Bay Freshwater Inflows Group has defined target frequencies for inflows to the estuary, based upon salinity and harvest models developed by the TCEQ and TPWD. The affects of the 2001 Regional Water Plans on the Bay were modeled, and the results are summarized in Table 7-1, below. While the table indicates that the combined plans will increase overall flows into Galveston Bay, it does not reflect the change in inflow locations. The transfer of water from the Trinity River basin into the San Jacinto basin will relocate return flows from Trinity Bay to Upper Galveston Bay. This may have some impact on the oyster beds located within Trinity Bay. The increase of flows into Upper Galveston Bay should be less of a concern, because that flow will occur in the Houston Ship Channel (a dredged channel that is significantly deeper than the rest of the estuary).

This plan recommends one less water management strategy in the Trinity basin than the scenario modeled. Bedias Reservoir was recommended in the 2001 Region H Water Plan, with the yield being transferred into Montgomery County. This was replaced through reallocation of existing supplies, and the addition of wastewater reuse within Harris County. Those two changes (reuse and elimination of the transfer) will reduce the return flows into Upper Galveston Bay, but are not expected to reduce the total inflows below the target frequencies. The removal of Bedias Reservoir will increase the projected inflows to Trinity Bay. However, Region C is considering additional wastewater reuse in their 2006 Water Plan. The amount of reuse recommended must be determined before an assessment of the impacts on Galveston Bay can be made.

Table 7-1: Overall Frequencies of Meeting Monthly Inflow Targets

Inflow Target	Max H	Min Q	Min Q-Sal
Historical Frequency	66%	78%	82%
GBFIG Target Frequency	50%	60%	75%
Naturalized	68%	67%	83%
Current Conditions	64%	59%	79%
Full Diversions with Return Flows	65%	59%	81%
Full Diversions with no Return Flows	43%	42%	55%
Full Diversions w RF And Region C & H Strategies	71%	67%	87%

7.3.5 Energy Reserves

Oil, gas and other energy reserves are considered natural resources of the state. While Region H is home to a large portion of the nation's petrochemical industry, the amount of actual oil and gas mining within Region H is small compared to other portions of the state. In this plan, Region H was able to identify reliable supply to meet all projected mining and manufacturing demands throughout the planning period. No adverse affect on this resource is foreseen.

Appendix 7A

Agricultural Census Data

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Appendix A to Chapter 7
Agricultural Census Data

Table 7A-1: Land in farms (acres)

	1987	1992	1997	2002	% Change (1987-2002)
Austin	347,215	337,351	367,432	367,497	5.8%
Brazoria	537,077	563,993	566,809	613,891	14.3%
Chambers	306,606	251,249	241,933	274,853	-10.4%
Fort Bend	363,823	422,464	431,582	415,251	14.1%
Galveston	98,924	102,229	104,941	127,280	28.7%
Harris	374,759	308,344	311,005	304,868	-18.6%
Leon	499,334	482,165	514,724	562,615	12.7%
Liberty	362,794	342,213	306,783	304,574	-16.0%
Madison	222,574	243,989	223,690	244,524	9.9%
Montgomery	188,284	193,885	193,375	197,892	5.1%
Polk	144,390	141,215	135,988	129,956	-10.0%
San Jacinto	91,209	82,721	84,620	93,497	2.5%
Trinity	133,122	109,635	98,748	104,724	-21.3%
Walker	269,832	213,923	183,988	206,311	-23.5%
Waller	276,750	242,901	238,110	277,000	0.1%
Region H	4,216,693	4,038,277	4,003,728	4,224,733	0.2%

Table 7A-2: Total cropland (acres)

	1987	1992	1997	2002	% Change (1987-2002)
Austin	155,357	161,996	161,192	134,793	-13.2%
Brazoria	195,681	221,812	203,341	224,640	14.8%
Chambers	109,707	120,193	118,316	134,492	22.6%
Fort Bend	162,516	191,148	193,138	194,001	19.4%
Galveston	38,242	38,543	30,285	45,773	19.7%
Harris	162,421	142,216	118,827	124,340	-23.4%
Leon	144,407	175,179	182,633	184,627	27.9%
Liberty	183,670	163,630	159,841	156,413	-14.8%
Madison	72,388	84,345	79,105	91,864	26.9%
Montgomery	43,583	49,621	47,711	57,776	32.6%
Polk	37,013	37,294	42,208	44,673	20.7%
San Jacinto	20,252	24,432	28,355	35,427	74.9%
Trinity	46,740	54,531	49,188	42,771	-8.5%
Walker	56,318	59,530	60,192	61,715	9.6%
Waller	121,223	118,632	116,477	124,431	2.6%
Region H	1,549,518	1,643,102	1,590,809	1,657,736	7.0%

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Agricultural Census Data

Table 7A-3: Irrigated land (acres)

	1987	1992	1997	2002	% Change (1987-2002)
Austin	3,026	3,781	4,954	3,541	17.0%
Brazoria	33,271	38,682	29,596	17,138	-48.5%
Chambers	24,748	32,127	24,894	16,152	-34.7%
Fort Bend	13,291	16,415	17,039	15,751	18.5%
Galveston	4,713	3,120	1,449	1,703	-63.9%
Harris	13,630	15,749	10,454	7,295	-46.5%
Leon	492	485	1,667	1,383	181.1%
Liberty	21,302	29,142	14,092	11,828	-44.5%
Madison	311	135	208	243	-21.9%
Montgomery	163	406	474	1,287	689.6%
Polk	121	36	377	99	-18.2%
San Jacinto	76	132	104	292	284.2%
Trinity	55	14	52	213	287.3%
Walker	161	170	325	600	272.7%
Waller	5,461	8,187	8,120	11,908	118.1%
Region H	120,821	148,581	113,805	89,433	-26.0%

Table 7A-4: Land in irrigated farms (acres)

	1987	1992	1997	2002	% Change (1987-2002)
Austin	21,782	26,550	39,537	24,162	10.9%
Brazoria	198,605	172,446	157,328	117,411	-40.9%
Chambers	179,509	132,618	92,798	82,026	-54.3%
Fort Bend	67,502	65,470	71,369	70,799	4.9%
Galveston	20,682	13,121	5,556	9,669	-53.2%
Harris	72,078	62,473	54,502	37,006	-48.7%
Leon	7,574	3,848	11,700	9,167	21.0%
Liberty	148,439	138,307	92,453	50,930	-65.7%
Madison	6,164	3,388	5,784	2,117	-65.7%
Montgomery	1,451	3,158	1,942	11,239	674.6%
Polk	545	144	4,331	1,137	108.6%
San Jacinto	518	597	973	1,991	284.4%
Trinity	870	112	240	922	6.0%
Walker	4,686	2,322	21,121	5,970	27.4%
Waller	54,443	49,874	40,666	45,540	-16.4%
Region H	784,848	674,428	600,300	470,086	-40.1%

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Agricultural Census Data

Table 7A-5: Land in irrigated farms, harvested cropland (acres)

	1987	1992	1997	2002	% Change (1987-2002)
Austin	4,053	4,425	8,201	5,857	44.5%
Brazoria	53,866	55,395	42,533	42,074	-21.9%
Chambers	30,954	35,563	26,550	18,611	-39.9%
Fort Bend	26,078	26,899	29,735	31,805	22.0%
Galveston	6,214	3,421	1,445	1,538	-75.2%
Harris	18,996	20,609	12,691	13,837	-27.2%
Leon	621	507	1,834	1,601	157.8%
Liberty	52,409	56,736	39,882	30,840	-41.2%
Madison	1,461	(D)	1,496	571	-60.9%
Montgomery	229	618	577	1,209	427.9%
Polk	147	36	365	230	56.5%
San Jacinto	96	157	131	315	228.1%
Trinity	75	22	51	241	221.3%
Walker	190	108	(D)	802	322.1%
Waller	11,009	17,854	13,835	15,388	39.8%
Region H	206,398	222,350	179,326	164,919	-20.1%

(D) Withheld to avoid disclosing data for individual farms.

Table 7A-6: Rice (hundredweight)

	1987	1992	1997	2002	% Change (1987-2002)
Austin	159,111	207,445	175,843	130,601	-17.9%
Brazoria	1,535,740	1,713,898	1,134,188	1,013,213	-34.0%
Chambers	1,070,528	1,276,063	949,505	713,173	-33.4%
Fort Bend	575,994	676,342	658,485	803,346	39.5%
Galveston	221,713	127,871	51,563	75,527	-65.9%
Harris	564,625	584,225	356,432	107,876	-80.9%
Leon	0	0	0	0	N/A
Liberty	983,301	1,267,760	604,582	464,751	-52.7%
Madison	0	0	0	0	N/A
Montgomery	0	0	0	0	N/A
Polk	0	0	0	0	N/A
San Jacinto	0	0	0	0	N/A
Trinity	0	0	0	0	N/A
Walker	0	0	0	0	N/A
Waller	285,531	413,337	468,471	679,960	138.1%
Region H	5,396,543	6,266,941	4,399,069	3,988,447	-26.1%

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Table 7A-7: Rural Land Use Data

Austin

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	408,229	403,425	-4,804
Dryland Crop	38,799	31,967	-6,832
Irrigated Crop	5,772	7,069	1,297
Improved Pasture	49,156	100,738	51,582
Native Rangeland	296,906	250,155	-46,751
Other	17,354	12,895	-4,459
Timberland	242	601	359

Brazoria

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	556,123	539,461	-16,662
Dryland Crop	28,873	15,951	-12,922
Irrigated Crop	128,456	113,888	-14,568
Improved Pasture	9,189	36,189	27,000
Native Rangeland	365,001	347,751	-17,250
Other	24,159	25,102	943
Timberland	445	580	135

Chambers

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	273,197	261,713	-11,484
Dryland Crop	13,578	2,573	-11,005
Irrigated Crop	123,057	98,269	-24,788
Improved Pasture	8,635	9,069	434
Native Rangeland	104,669	115,276	10,607
Other	9,489	24,193	14,704
Timberland	13,769	12,333	-1,436

Fort Bend

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	355,487	342,356	-13,131
Dryland Crop	101,106	82,210	-18,896
Irrigated Crop	28,450	32,186	3,736
Improved Pasture	17,570	27,083	9,513
Native Rangeland	205,765	197,004	-8,761
Other	2,518	3,746	1,228
Timberland	78	127	49

Galveston

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	92,147	101,154	9,007
Dryland Crop	224	286	62
Irrigated Crop	33,027	26,804	-6,223
Improved Pasture	7,861	8,293	432
Native Rangeland	50,942	64,593	13,651
Other	93	1,178	1,085
Timberland	0	0	0

Harris

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	185,785	174,053	-11,732
Dryland Crop	21,043	11,379	-9,664
Irrigated Crop	14,193	7,534	-6,659
Improved Pasture	18,750	18,671	-79
Native Rangeland	87,904	80,519	-7,385
Other	5,350	19,822	14,472
Timberland	38,545	36,128	-2,417

Leon

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	648,488	680,099	31,611
Dryland Crop	0	0	0
Irrigated Crop	0	0	0
Improved Pasture	252,522	0	-252,522
Native Rangeland	378,783	530,129	151,346
Other	0	123,892	123,892
Timberland	17,183	26,078	8,895

Liberty

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	598,553	620,610	22,057
Dryland Crop	56,107	56,202	95
Irrigated Crop	52,500	31,146	-21,354
Improved Pasture	44,556	66,827	22,271
Native Rangeland	146,663	146,543	-120
Other	9,151	2,988	-6,163
Timberland	289,576	316,904	27,328

Madison

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	607,484	607,904	420
Dryland Crop	9,811	12,068	2,257
Irrigated Crop	6,979	5,746	-1,233
Improved Pasture	18,831	30,318	11,487
Native Rangeland	268,424	549,798	281,374
Other	303,439	9,974	-293,465
Timberland	0	0	0

Montgomery

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	368,389	330,118	-38,271
Dryland Crop	0	0	0
Irrigated Crop	0	0	0
Improved Pasture	6,264	10,111	3,847
Native Rangeland	89,981	98,227	8,246
Other	157	128	-29
Timberland	271,987	221,652	-50,335

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Polk

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	524,757	483,590	-41,167
Dryland Crop	0	0	0
Irrigated Crop	0	0	0
Improved Pasture	48,163	85,309	37,146
Native Rangeland	49,205	3,725	-45,480
Other	247	533	286
Timberland	427,142	394,023	-33,119

San Jacinto

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	195,044	199,223	4,179
Dryland Crop	509	2,056	1,547
Irrigated Crop	33	25	-8
Improved Pasture	26,130	37,753	11,623
Native Rangeland	40,627	38,683	-1,944
Other	284	12	-272
Timberland	127,461	120,694	-6,767

Trinity

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	388,395	391,412	3,017
Dryland Crop	1,288	79	-1,209
Irrigated Crop	0	0	0
Improved Pasture	22,191	20,448	-1,743
Native Rangeland	109,149	100,744	-8,405
Other	25	893	868
Timberland	255,742	269,248	13,506

Walker

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	312,570	320,913	8,343
Dryland Crop	0	0	0
Irrigated Crop	0	0	0
Improved Pasture	22,508	56,278	33,770
Native Rangeland	156,454	122,914	-33,540
Other	0	173	173
Timberland	133,608	141,548	7,940

Waller

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	370,737	367,294	-3,443
Dryland Crop	71,451	66,715	-4,736
Irrigated Crop	37,210	28,855	-8,355
Improved Pasture	53,409	55,035	1,626
Native Rangeland	187,884	197,177	9,293
Other	5,711	5,076	-635
Timberland	15,072	14,436	-636

Region H Total*

Landuse type	Acres in 1992	Acres in 2001	10 year change
All	5,885,385	5,823,325	-62,060
Dryland Crop	342,789	281,486	-61,303
Irrigated Crop	429,677	351,522	-78,155
Improved Pasture	605,735	562,122	-43,613
Native Rangeland**	2,538,357	2,843,238	304,881
Other	377,977	230,605	-147,372
Timberland	1,590,850	1,554,352	-36,498

* includes all of Polk and Trintiy Counties

** increse due to Leon County reclassification

Appendix 7B

Threatened and Endangered Species within Region H

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Threatened and Endangered Species within Region H

Listed below are the state- and federally-listed threatened and endangered aquatic species within Region H, by county.

Austin County

Houston Toad (Bufo houstonensis) - endemic; species sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil when inactive; breeds February-June

Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

Brazoria County

Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail (*Laterallus jamaicensis*) - salt, brackish, and freshwater marshes, pond borders, wet meadows, & grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Swallow-tailed Kite (*Elanoides forficatus*) - lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

Colonial waterbird nesting areas - many rookeries active annually

Corkwood (*Leitneria floridana*) – small, sparingly-branched, dioecious, deciduous shrub or small tree; forms thickets of stick-like erect stems, the diameter of each at base rarely to 12 or

13 cm; found in narrow zone between brackish marsh and contiguous coastal pine-hardwood; brackish or freshwater swamps or thickets; flowers in spring

Chambers County

Interior Least Tern (*Sterna antillarum athalassos*) – this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony

Swallow-tailed Kite (*Elanoides forficatus*) – lowland forested regions, especially swampy areas, ranging into open woodlands; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

White-faced Ibis (*Plegadis chihi*) – prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

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Fort Bend County

Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other bird

White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

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Galveston County

Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds
Black Rail (*Laterallus jamaicensis*) - salt, brackish, and freshwater marshes, pond borders, wet meadows, & grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia
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Colonial waterbird nesting areas - many rookeries active annually
Alligator Snapping Turtle (*Macrochelys temminckii*) - deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October
Correll's false dragon-head (*Physostegia correllii*) – wet soils including roadside ditches and irrigation channels; flowering June-July

<u>Harris County</u>
Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds
Black Rail (*Laterallus jamaicensis*) – salt, brackish, and freshwater marshes, pond borders, wet meadows, & grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia
Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960
Colonial waterbird nesting areas - many rookeries active annually
Creek Chubsucker (*Erimyzon oblongus*) - small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks
Alligator Snapping Turtle (*Macroclemys temminckii*) - deep water of rivers, canals, lakes,

and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Leon County

Houston Toad (Bufo houstonensis) - endemic; species sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil when inactive; breeds February-June

Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Interior Least Tern (*Sterna antillarum athalassos*) – this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony

Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

Paddlefish (*Polyodon spathula*) - prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir

Liberty County

Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Swallow-tailed Kite (*Elanoides forficatus*) - lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

Colonial waterbird nesting areas - many rookeries active annually

Creek Chubsucker (*Erimyzon oblongus*) – small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in

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Paddlefish (*Polyodon spathula*) - prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir

Alligator Snapping Turtle (*Macrochelys temminckii*) - deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Madison County

Houston Toad (Bufo houstonensis) - endemic; species sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil when inactive; breeds February-June

Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

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Montgomery County

Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but can be found in brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

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Correll's false dragon-head (*Physostegia correllii*) - wet soils including roadside ditches and irrigation channels; flowering June-July (blank)

Polk County
Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds
Swallow-tailed Kite (*Elanoides forficatus*) - lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees
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San Jacinto County
Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds
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Walker County
Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds
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Waller County
Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

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Appendix 7C

Texas Parks and Wildlife Department Analysis of Water Management Strategies Recommended in the 2001 Region H Plan

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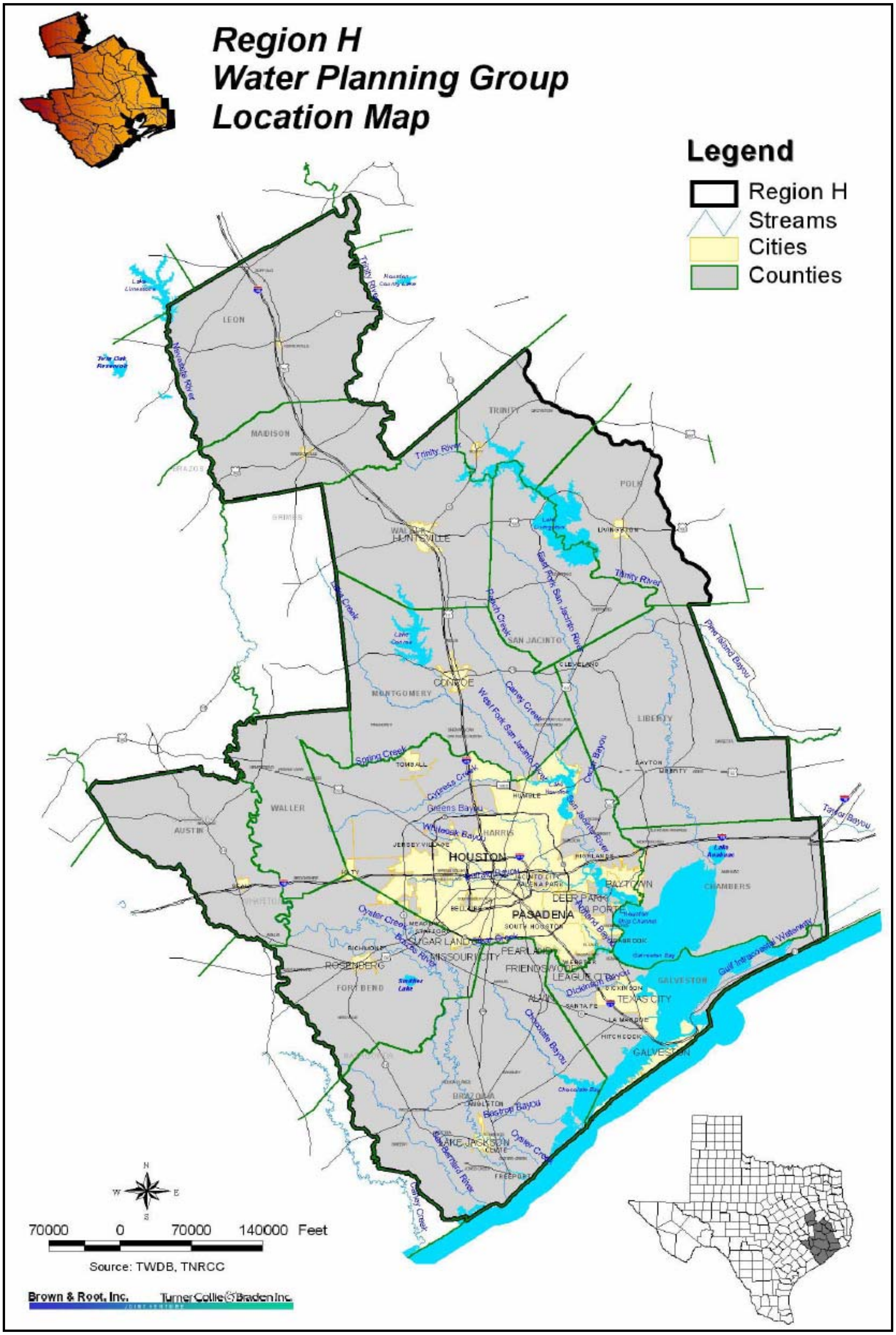
Texas Parks and Wildlife Department
Analysis of Water Management Strategies
Recommended in the 2001 Region H Water Plan

The Resource Protection Division of the Texas Parks and Wildlife Department prepared the attached document: Region H Strategies – Preliminary Assessment, Internal Working Memorandum, 2001.

The following changes between the 2001 Region H Plan and this update to the plan should be noted:

- The final impoundment plan for Allens Creek Reservoir, as submitted and approved in the water right application, was changed from the outline included in the 2001 Region H Water Plan. The project footprint was reduced to avoid Alligator Hole.
- Bedias Creek Reservoir and the related Interbasin Transfer from Bedias to Lake Conroe is not a recommended strategy in the 2006 update to the Region H plan.
- Little River Reservoir has been replaced in the 2006 update to the Region H Plan with an off-channel reservoir in the Little River Basin.
- The SJRA/Lake Livingston Diversion was not a recommended strategy in the 2001 Region H Plan, nor is it recommended in the 2006 update.
- The Sabine to Region H Interbasin Transfer was not a recommended strategy in the 2001 Region H Plan, nor is it recommended in the 2006 update.

Texas Parks and Wildlife Department
Region H Strategies – Preliminary Assessment
Internal Working Memorandum
2001


Region H
Water Planning Group
Location Map
Legend
Region H
Streams
Cities
Counties
LEON
MADISON
TRINITY
POLK
WALKER
HUNTSVILLE
SAN JACINTO
CLEVELAND
MONTGOMERY
CONROE
LIBERTY
WALLER
AUSTIN
HARRIS
HOUSTON
HUMBLE
BAYTOWN
DEER PARK
PASADENA
CHAMBERS
SUGAR LAND
MISSOURI CITY
PEARLAND
FRIENDSWOOD
LEAGUE CITY
ROSENBERG
FORT BEND
ALVIN
TEXAS CITY
GALVESTON
BRAZORIA
LAKE JACKSON
Trinity River
Spring Creek
Cypress Creek
Greens Bayou
Dickinson Bayou
Chocolate Bayou
Bastrop Bayou
Oyster Creek
Taylor Bayou
Gulf Intracoastal Waterway
70000 0 70000 140000 Feet
Source: TWDB, TNRCC
Brown & Root, Inc.
Turner Collie & Braden Inc.

Region H		Houston RWPG	
Proposed Project / Strategy	**acre/feet**	**Concerns/Potential Impacts**	**Date Needed**
Allens Creek Reservoir (BRA/Houston)	99,650/yr	Loss/alteration of habitat to inundation (8,250 acres); Reduced instream flows and freshwater inflows; Pipeline construction from reservoir (bed and banks, wetlands, terrestrial habitat, rare species)	Now
Bedias Creek Reservoir (SJRA/TRA)	90,700/yr	Loss/alteration of habitat to inundation ; Reduced instream flows; Pipeline construction from reservoir (bed and banks, wetlands, terrestrial habitat, rare species)	2030
Little River Reservoir (BRA/GCWA)	129,000/yr	Loss/alteration of habitat to inundation; Reduced instream flows; Pipeline construction from reservoir (bed and banks, wetlands, terrestrial habitat, rare species)	????
Luce Bayou transfer (City of Houston)	75,000/yr	8 miles of rectification; Reduced flows in Trinity River; Reduced freshwater inflows to Trinity Bay; Increased flows in Luce Bayou; Loss/alteration of habitat	2020
SJRA/City of Houston contract	67,029/yr	Reduced instream flows between Conroe and Lake Houston; Alteration/loss of habitat; Pipeline construction?	2030
SJRA/Lake Livingston Diversion	75,000/yr	Rectification of stream channel and increased flows in San Jacinto River; Reduced instream flows downstream of Lake Livingston; Reduced freshwater inflows to Trinity Bay; Pipeline construction?	2030
TRA/City of Houston contract	200,000/yr	CWA canal or Luce Bayou	2040
Bedias transfer	90,700/yr	Rectification of and increased flows in Mock Branch and West Fork San Jacinto River; Pipeline construction (bed and banks, wetlands)	2030
GCWA/City of Houston contract (Trinity River water to Galveston)	23,000/yr	Reduced freshwater inflows to Trinity Bay; Pipeline construction (bed and banks, wetlands, rare species)	2050
Sabine transfer for all water user groups	101,500 - 453,100/yr	Interbasin transfer; Pipeline construction (bed and banks, wetlands, loss of habitat, rare species, cultural resources); movement of exotic species or species not native to receiving basin	2010-2050

STRATEGY: Allens Creek Reservoir

SPONSOR: Brazos River Authority, City of Houston

SUMMARY

DESCRIPTION: The reservoir site is located on Allens Creek, a tributary to the Brazos River, in Austin County. A permit has been issued for this project to the TWDB for industrial purposes for the consumptive use of 46,256 acre-feet per year. The Brazos Rivber Authority (BRA) and the City of Houston (COH) have recently submitted a permit amendment to increase the project yield, change the use type and become project sponsors. The BRA is in the process of purchasing the entire site from Reliant Energy (this may have already been accomplished). The project is configured as a scalping reservoir that would divert stormwater flows from the Brazos River and impound these flows into the reservoir to create storage yield. Maximum dam height is 53 feet and the conservation storage capacity is approximately 145,500 acre-feet at an elevation of 121.0 feet msl.

COST: $157.3 million (1999)

STARTING DECADE: 2000

QUANTITY OF WATER: 99,650 acre-feet per year

LAND IMPACTED: 7,000 acres (Region H Plan, 2001); 8,250 acres (Bauer et al, 1991)

PURPOSE: Municipal, Industrial, and Irrigation Water Supply and Recreation

ISSUES AFFECTING FEASIBILITY: The Texas Legislature has designated this site as a Unique Reservoir Site. The Water Planning Group rated environmental impacts moderate to small and also reported no endangered species have been found on the site. TPWD's Wildlife Diversity Program reports the following rare species may be found in Austin County:

Houston Toad (State and Federally Endangered)
American Peregrine Falcon (State Endangered/Federally Delisted)
Arctic Peregrine Falcon (State Threatened/Federally Delisted)
Attwater's Greater Prairie Chicken (State and Federally Endangered)
Bald Eagle (State and Federally Threatened)
Henslow's Sparrow (State Species of Concern)
Mountain Plover (State Species of Concern)
White-faced Ibis (Federal Species of Concern/State Threatened)
White-tailed Hawk (Federal Species of Concern/State Threatened)
Whooping Crane (State and Federally Endangered)
Wood Stork (Federal Species of Concern/State Threatened)
Plains Spotted Skunk (State Species of Concern)

Smooth Green Snake (Federal Species of Concern/State Threatened)
Texas Garter Snake (State Species of Concern)
Texas Horned Lizard (Federal Species of Concern/State Threatened)
Timber/Canebrake Rattlesnake (Federal Species of Concern/State Threatened)

Diversion of floodflows from the Brazos River will result in the reduction/alteration of instream flows and freshwater inflows to the Gulf of Mexico. There is a USGS gage on the Brazos River upstream of the project location near the City of Hempstead (USGS gage # 08111500) and another gage downstream near the City of Richmond (USGS gage # 08114000). At times, flows in the Brazos River in the project area are affected by reservoirs on the Brazos River at Waco and by reservoirs on the Lampasas and Little Rivers above Cameron. Median monthly flows (cfs), minimum flows (cfs), and maximum flows (cfs) from the aforementioned gages are presented below:

Monthly median flows (cfs) as reported from USGS gage # 08111500 near Hempstead, TX for the Period of Record (1938 to current year):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2840	3790	3370	3840	7400	5500	2190	1430	1440	1450	1670	2380

Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
386	483	425	922	953	1027	817	714	453	180	318	299

Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
55994	54748	50455	42857	69861	51960	18998	11507	18028	24832	29487	41594

Monthly median flows (cfs) as reported from USGS gage # 08114000 near Richmond, TX for the Period of Record (1922 to current year):

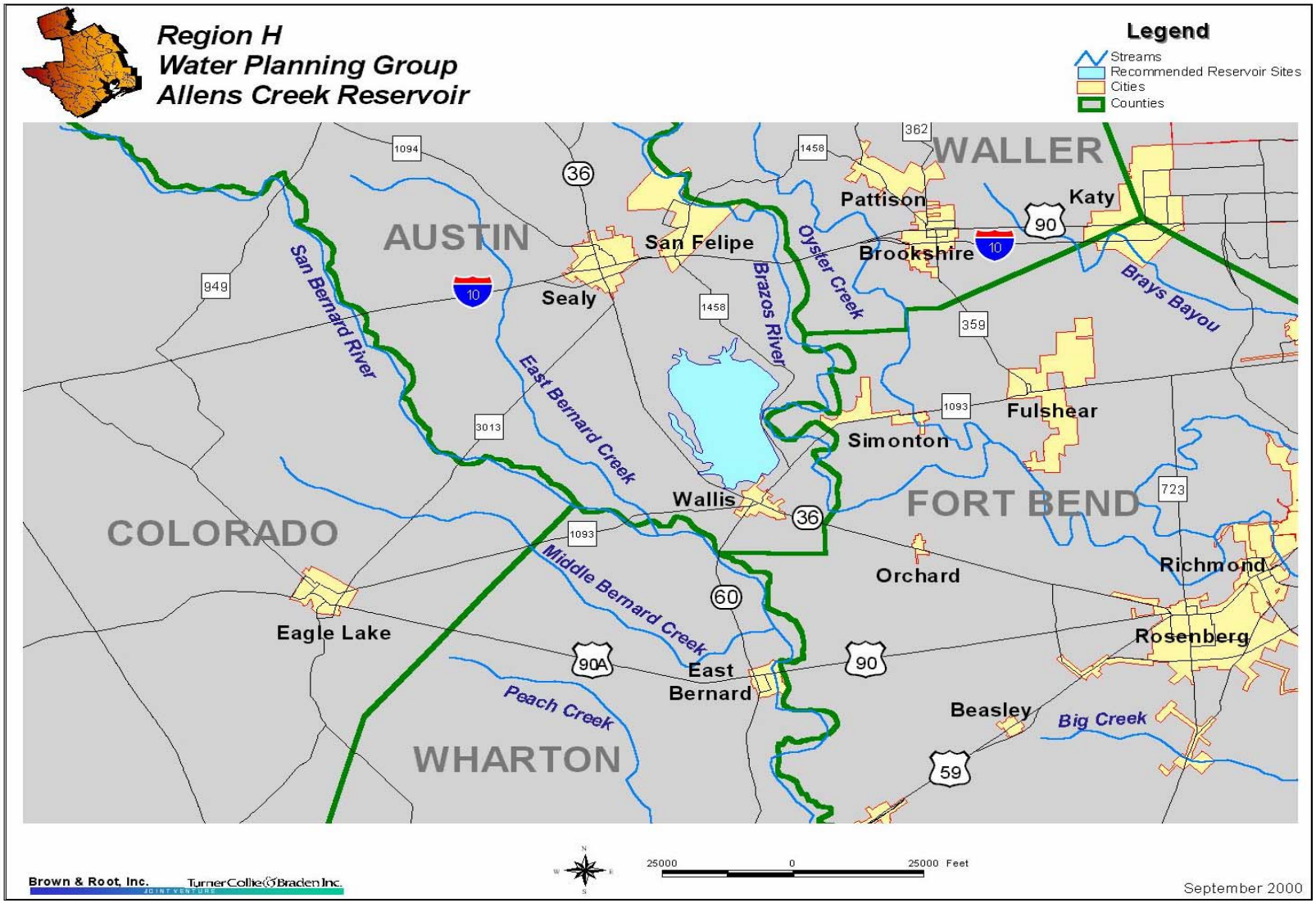
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3540	4600	4400	4300	7310	5900	2360	1440	1570	1700	2000	2595

Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
542	527	445	453	818	603	221	141	414	202	366	479

Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
60497	54407	54052	41900	77197	58350	21261	11802	19847	28763	32360	52865


Region H
Water Planning Group
Allens Creek Reservoir
Legend
Streams
Recommended Reservoir Sites
Cities
Counties
WALLER
AUSTIN
COLORADO
WHARTON
FORT BEND
Pattison
Katy
San Felipe
Brookshire
Sealy
Fulshear
Simonton
Wallis
Orchard
Richmond
Rosenberg
Eagle Lake
East Bernard
Beasley
San Bernard River
Brazos River
Oyster Creek
Brays Bayou
East Bernard Creek
Middle Bernard Creek
Peach Creek
Big Creek
1094
36
1458
362
949
10
90
359
1093
3013
723
60
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59
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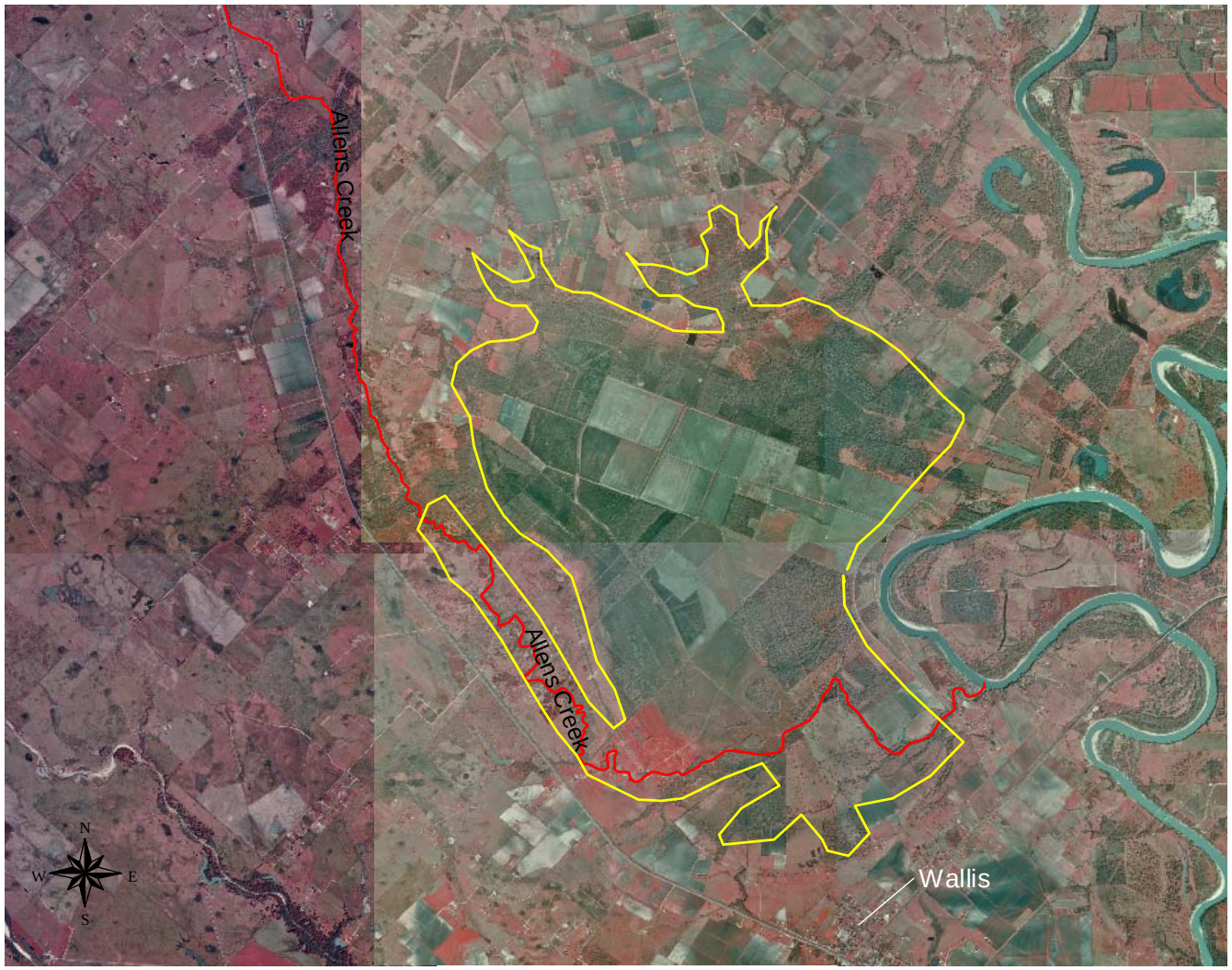
25000 Feet
Brown & Root, Inc.
Turner Collie & Braden Inc.
JOINT VENTURE
September 2000


Allens Creek
Allens Creek
N
W
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S
Wallis

STRATEGY: Bedias Creek Reservoir

SPONSOR: San Jacinto River Authority, Trinity River Authority

SUMMARY

DESCRIPTION: The reservoir site is located principally within Madison County in the Trinity River Basin and includes Bedias and Caney Creeks. The upstream drainage area is approximately 395 square miles. The dam is proposed with a maximum height of 45 feet and a normal pool elevation of 230.0 feet msl. The reservoir is proposed to have a conservation storage capacity of 181,000 acre-feet and would inundate about 13,000 acres.

COST: $132 million (1999)

STARTING DECADE: 2030

QUANTITY OF WATER: 90,700 acree-feet per year

LAND IMPACTED: 27,400 acres

PURPOSE: Municipal Water Supply and Flood Control

ISSUES AFFECTING FEASIBILITY:

Several rare species have been documented in the area and others are likely to occur in the project area. Documented and probable rare species that may be impacted by this project are listed below:

Documented Species:
Bald Eagle (State and Federally Threatened)
Red-cockaded Woodpecker (State and Federally Endangered)
Interior Least Tern (State and Federally Endangered)
Louisiana Pine Snake (State Threatened)
Reddish Egret Federal Species of Concern/State Threatened)
White-faced Ibis (Federal Species of Concern/State Threatened)
Wood Stork (Federal Species of Concern/State Threatened)
Arctic Peregrine Falcon (State Threatened/Federally Delisted)
Texas Horned Lizard (Federal Species of Concern/State Threatened)
Alligator Snapping Turtle (Federal Species of Concern/State Threatened)
Timber Rattlesnake (Federal Species of Concern/State Threatened)
Creek Chubsucker (Federal Species of Concern/State Threatened)
Blue Sucker (Federal Species of Concern/State Threatened)
Navasota Ladies Tresses (State and Federally Endangered)

Probable Species:

Paddlefish (Federal Species of Concern/State Threatened)
Bachman's Sparrow (Federal Species of Concern/State Threatened)
Plains Spotted Skunk (State Species of Concern)
Texas Garter Snake (State Species of Concern)
Houston Toad (State and Federally Endangered)
Southeastern Myotis (State Species of Concern)

Various habitat types will be lost due to construction of Bedias Reservoir. The Cover Type and the estimated amount of acreage lost as presented in Frye and Curtis (1990) are listed below:

Cover Type:	**Acres Lost:**
Mixed Bottomland Hardwood Forest (Priority 2)	7,328
Grasses/Parks	7,036
Post Oak-Elm-Hackberry Forest	6,851
Other	3,460
Total	24,675

Construction of Bedias Reservoir will also significantly reduce instream flows and alter aquatic habitat within Bedias Creek. There is a USGS streamflow gage (#08065800) on Bedias Creek near the City of Madisonville. Monthly median flows, monthly minimums, and monthly maximums (cfs) from this gage for the period of record are reported below:

Monthly median flows (cfs) as reported from USGS gage # 08065800 near Madisonville, TX (October 1967 to current):

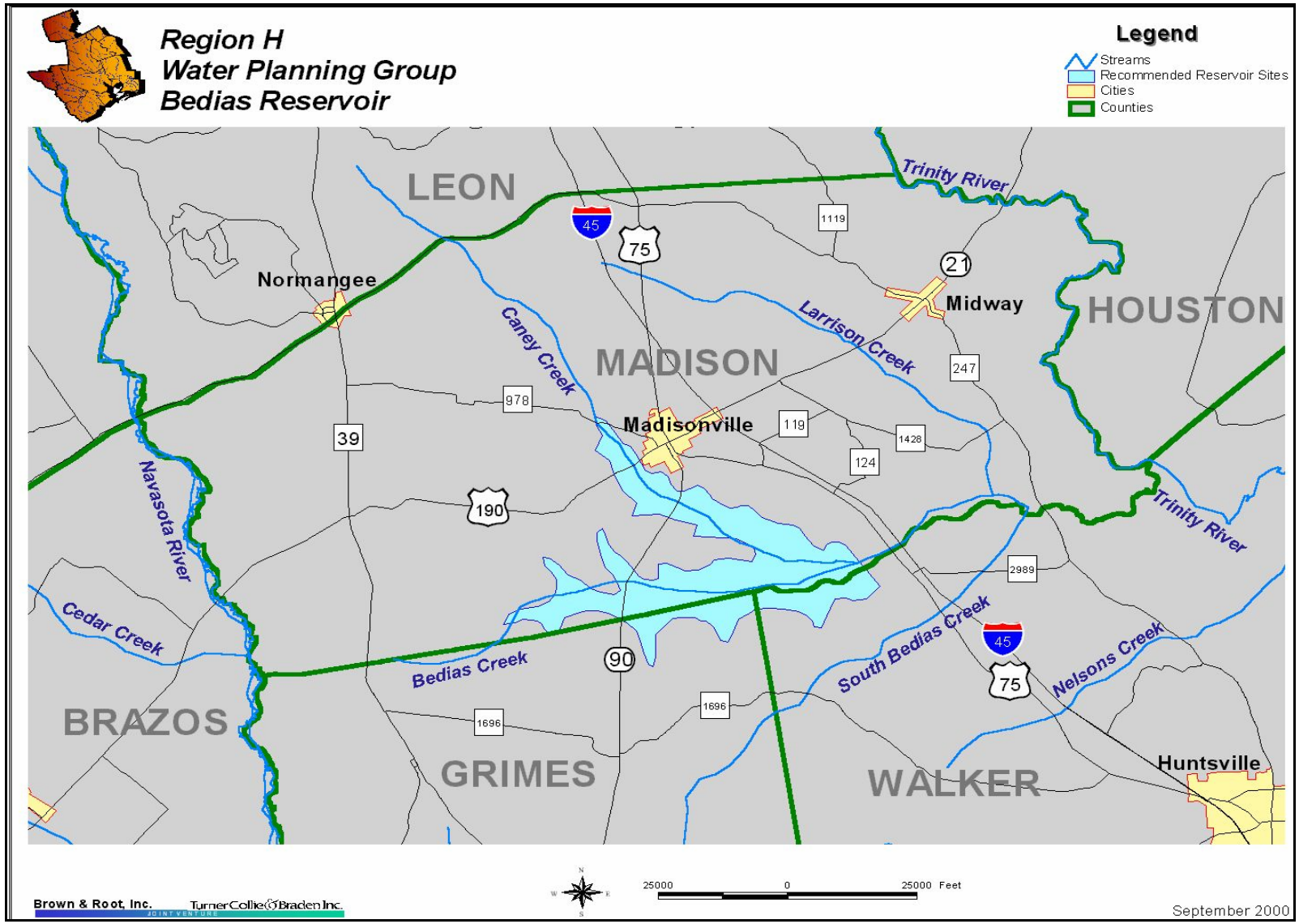
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
30	38	28	18	24	7.8	1.1	0.4	0.64	0.77	4.3	16

Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.0	3.8	3.1	2.3	2.7	0.43	0.01	0	0	0	0.03	0.2

Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	1580	908	1333	1046	1745	260	266	1551	3021	932	983


Region H
Water Planning Group
Bedias Reservoir
Legend
Streams
Recommended Reservoir Sites
Cities
Counties
LEON
MADISON
HOUSTON
BRAZOS
GRIMES
WALKER
Normangee
Madisonville
Midway
Huntsville
Trinity River
Caney Creek
Larrison Creek
Navasota River
Cedar Creek
Bedias Creek
South Bedias Creek
Nelsons Creek
45
75
21
39
190
90
1119
247
978
119
1428
124
2989
1696
25000
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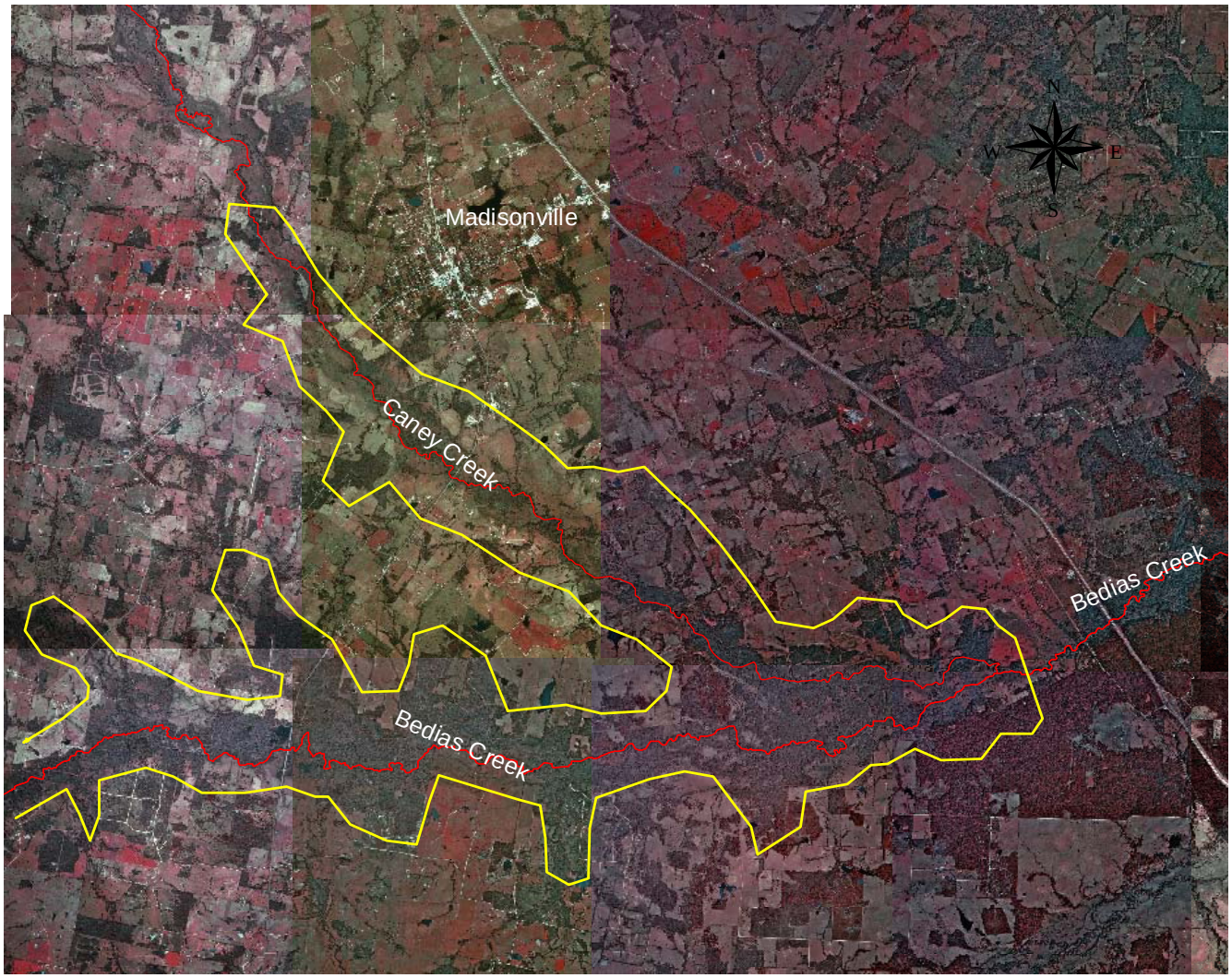
25000 Feet
Brown & Root, Inc.
Turner Collie & Braden Inc.
JOINT VENTURE
September 2000


N
W
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S
Madisonville
Caney Creek
Bedias Creek
Bedias Creek

STRATEGY: Little River Reservoir

SPONSOR: Brazos River Authority, Gulf Coast Water Authority

SUMMARY

DESCRIPTION: The reservoir site is located on the Little River just upstream of its confluence with the Brazos River within Milam County. The reservoir would have a surface area of 35,000 acres and a storage volume of about 930,000 acre-feet. Currently, the upstream drainage of approximately 7,500 square miles lacks any major impoundments.

COST: $361 million (1999)

STARTING DECADE: 2000

QUANTITY OF WATER: 129,000 acre-feet per year

LAND IMPACTED: 35,000 acres

PURPOSE: Municipal Water Supply

ISSUES AFFECTING FEASIBILITY: Construction of reservoir will result in loss/alteration of 35,000 acres. The habitat types and acreage affected have not been surveyed, although bottomland hardwoods likely comprise a large portion. Several rare species may be present in the project area, including:

Houston Toad (State and Federally Endangered)
American Peregrine Falcon (State Endangered/Federally Delisted)
Arctic Peregrine Falcon (State Threatened/Federally Delisted)
Interior Least Tern (State and Federally Endangered)
Zone-tailed Hawk (Federal Species of Concern/State Threatened)
Guadalupe Bass (State Species of Concern)
Texas Horned Lizard (Federal Species of Concern/State Threatened)
Navasota Ladies Tresses (State and Federally Endangered)
Parks' Jointweed (State Species of Concern)

The reservoir will also impound a currently free-flowing river, thus significantly altering instream flows and aquatic habitats. Alteration of aquatic habitat will likely affect some aquatic organisms, such as freshwater mussels. Little River is known to contain a thriving mussel population (J. Henson, pers. comm.). Nationally, 67% of freshwater mussels are rare or imperiled (Nature Conservancy, 1996). There is a USGS gage (#08106500) on Little River near the City of Cameron. Monthly median flows, monthly minimums, and monthly maximums (cfs) from this gage for the period of record are reported below:

Monthly median flows (cfs) as reported from USGS gage # 08106500 near Cameron, TX (1916 to current year):

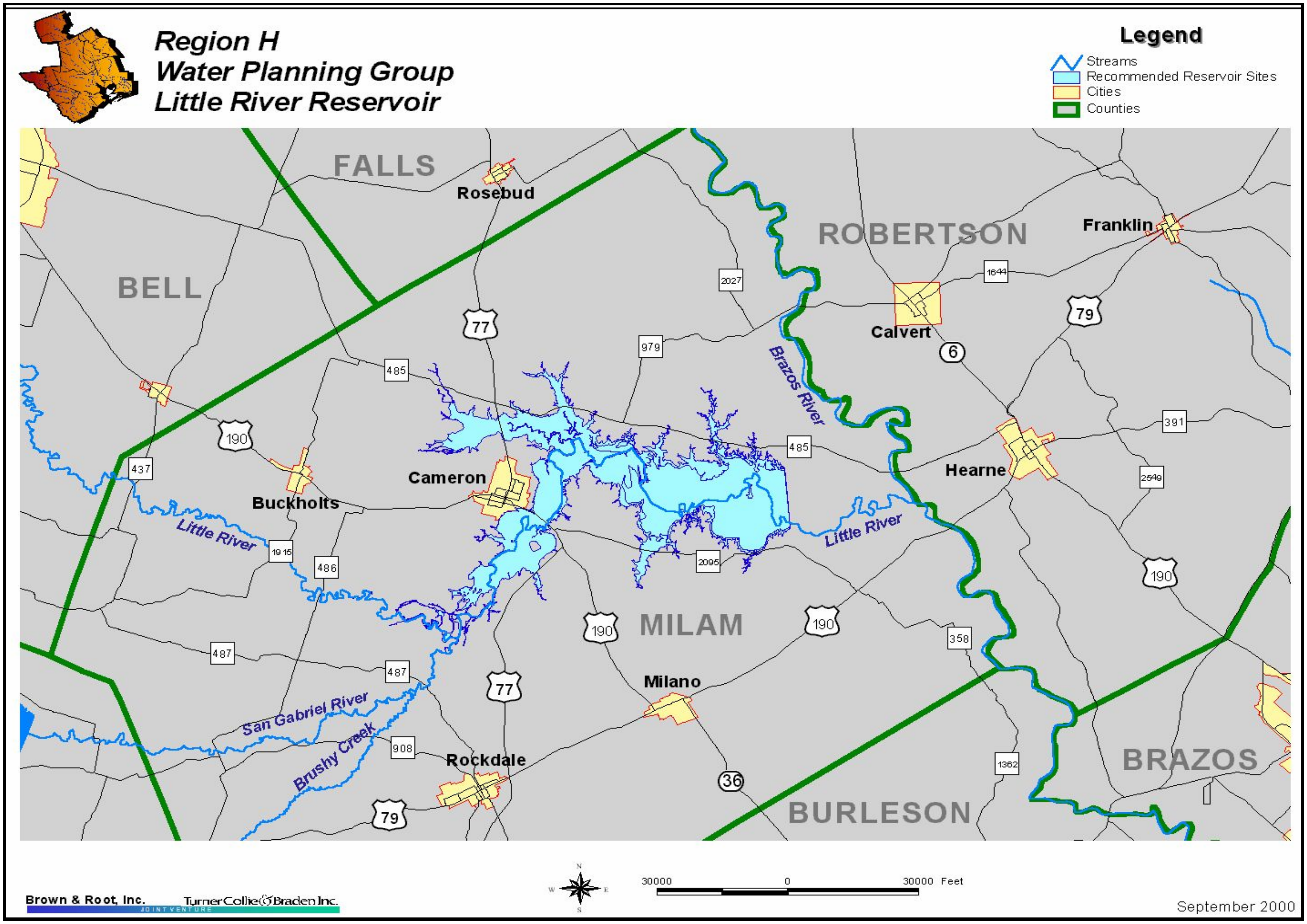
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
435	581	685	950	1520	1130	463	190	192	186	282	302

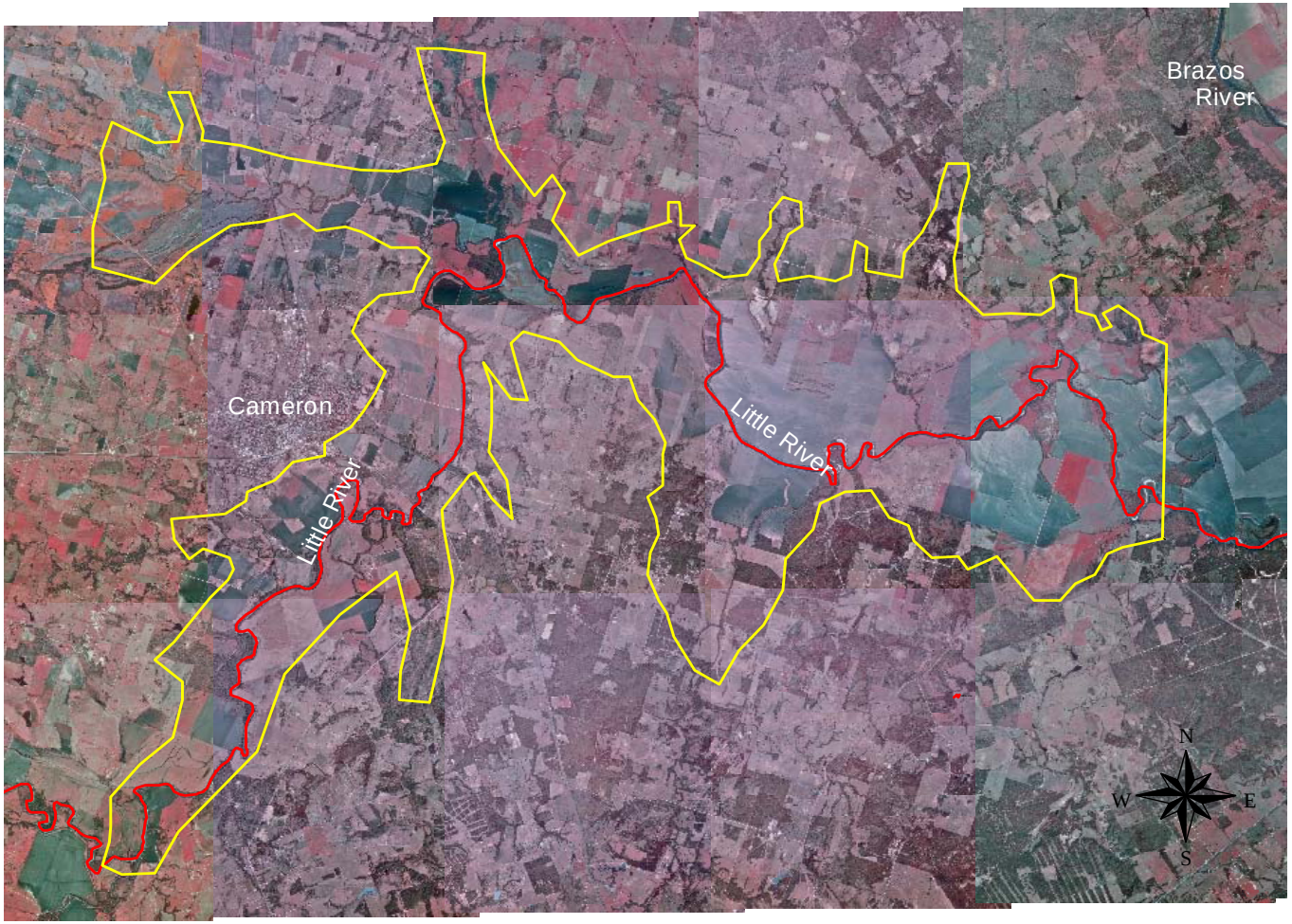
Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25	41	23	16	132	15	1.6	2.2	2.1	0.77	15	23

Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9662	13031	14423	13887	17385	11326	9426	5106	26298	10139	8506	9923


Region H
Water Planning Group
Little River Reservoir
Legend
Streams
Recommended Reservoir Sites
Cities
Counties
FALLS
Rosebud
BELL
ROBERTSON
Franklin
Calvert
Brazos River
Cameron
Hearne
Buckholts
Little River
Little River
MILAM
Milano
San Gabriel River
Brushy Creek
Rockdale
BRAZOS
BURLESON
30000 0 30000 Feet
Brown & Root, Inc.
Turner Collie & Braden Inc.
September 2000


Brazos
River
Cameron
Little River
Little River
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S

STRATEGY: Luce Bayou Transfer

SPONSOR: City of Houston

SUMMARY

DESCRIPTION: The City of Houston has planned the Northeast Water Purification Plant (NEWPP) to supply need in the northern parts of Harris County. The NEWPP will take its raw water directly from Lake Houston. The City's East Water Purification Plant (EWPP) and a group of industries also draw raw water supplies from Lake Houston. By the year 2020, demands will exceed the City's raw water supplies currently available in Lake Houston.

Supplies owned by the City of Houston in the Trinity River are sufficient to meet the shortfall, however, no conveyance system exists to deliver Trinity River water to Lake Houston. The Luce Bayou strategy will supply Trinity River water to the upstream end of Luce Bayou. From there, the water will flow to and be available from Lake Houston.

Luce Bayou diversion facilities will consist of a pumping station with river intake at Capers Ridge on the west bank of the Trinity River approximately 11 miles north of Liberty. A pipeline segment followed by an earthen canal will carry the flow from the pumping station to the upstream end of Luce Bayou. To accommodate the increased flow (220 MGD by 2050), the Luce Bayou channel will be widened, deepened and straightened from its headwaters to its confluence with Tarkington Bayou.

COST: $84 million (1999)

STARTING DECADE: 2020

QUANTITY OF WATER: 302,500 acre-feet per year

SUPPLY SOURCE: Trinity River

ISSUES AFFECTING FEASIBILITY: Construction of the Luce Bayou project will require rectification of approximately eight miles of Luce Bayou, altering the aquatic habitat and ecology in that segment, and possibly in downstream segments. The mixing of Trinity River water and San Jacinto River water in Lake Houston may have an adverse impact on the lake's ecology. Increased use of stored water from Lake Livingston may result in periodic or prolonged low lake levels, which may adversely impact the lake's ecology and/or recreational activities.

Land use in the Lake Houston drainage basin is about 73% forest and 14% pasture. Luce Bayou is bordered by one of the highest quality bottomland hardwood forests remaining in the Houston area. The Region H plan states "wetlands mitigation may be required to offset losses due to pumping station, pipeline, and canal construction." This is true, however, the rectification of Luce Bayou and subsequent impacts to riparian habitats will

also likely require significant mitigation. Mitigation may also be required for impacts to rare species, as several may be present in the project area, including:

Houston Toad (State and Federally Endangered)
American Peregrine Falcon (State Endangered/Federally Delisted)
Arctic Peregrine Falcon (State Threatened/Federally Delisted)
Reddish Egret (Federal Species of Concern/State Threatened)
White-faced Ibis (Federal Species of Concern/State Threatened)
Wood Stork (Federal Species of Concern/State Threatened)
Attwater's Greater Prairie Chicken (State and Federally Endangered)
Bald Eagle (State and Federally Threatened)
Henslow's Sparrow (State Species of Concern)
Mountain Plover (State Species of Concern)
Piping Plover (State and Federally Endangered)
Black Rail (State Species of Concern)
Brown Pelican (State and Federally Endangered)
Snowy Plover (State Species of Concern)
Swallow-tailed Kite (Federal Species of Concern/State Threatened)
Creek Chubsucker (Federal Species of Concern/State Threatened)
Plains Spotted Skunk (State Species of Concern)
Rafinesque's Big-eared Bat (Federal Species of Concern/State Threatened)
Southeastern Myotis (State Species of Concern)
Alligator Snapping Turtle (Federal Species of Concern/State Threatened)
Timber Rattlesnake (Federal Species of Concern/State Threatened)
Smooth Green Snake (Federal Species of Concern/State Threatened)
Texas Garter Snake (State Species of Concern)
Corkwood (State Species of Concern)
Giant Sharpstem Umbrella-sedge (State Species of Concern)
Houston Daisy (State Species of Concern)
Threeflower Broomweed (State Species of Concern)

Increased flows in Luce Bayou, which are estimated to be as high as 220 MGD (341 cfs) by the year 2050, will greatly affect aquatic organisms and may result in erosion problems. There is a USGS gage (#08071280) on Luce Bayou near the City of Huffman. Monthly median flows, monthly minimums, and monthly maximums (cfs) from this gage for the period of record are reported below:

Monthly median flows (cfs) as reported from USGS gage # 08071280 near Huffman, TX (May 1984 to current year):

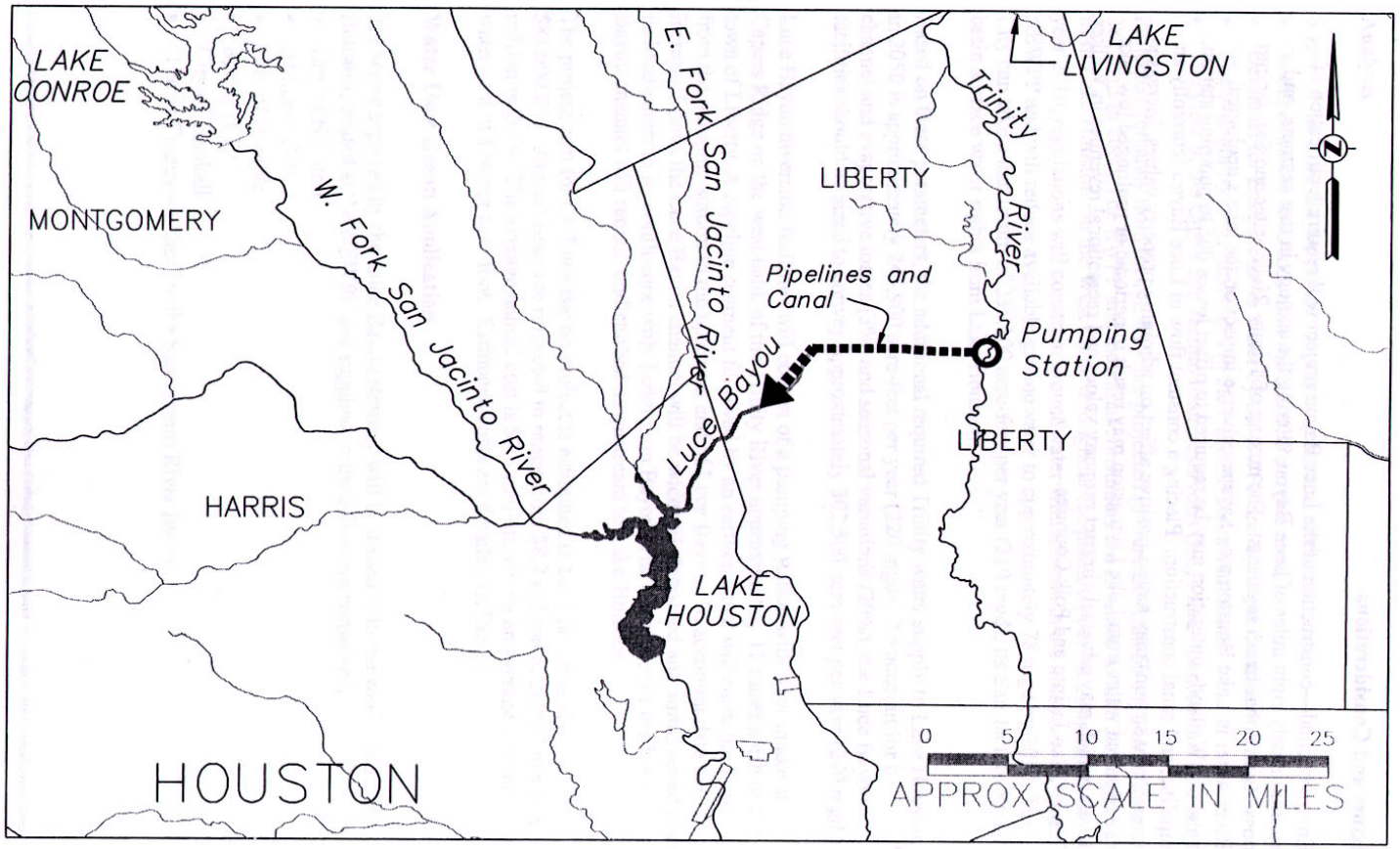
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
61	50	62	14	10	6.7	2.7	1.1	1.6	1.6	8.4	31

Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.1	1.3	1.6	3.1	0.57	0.12	0.01	0.35	0.03	0.01	0.17	1.4

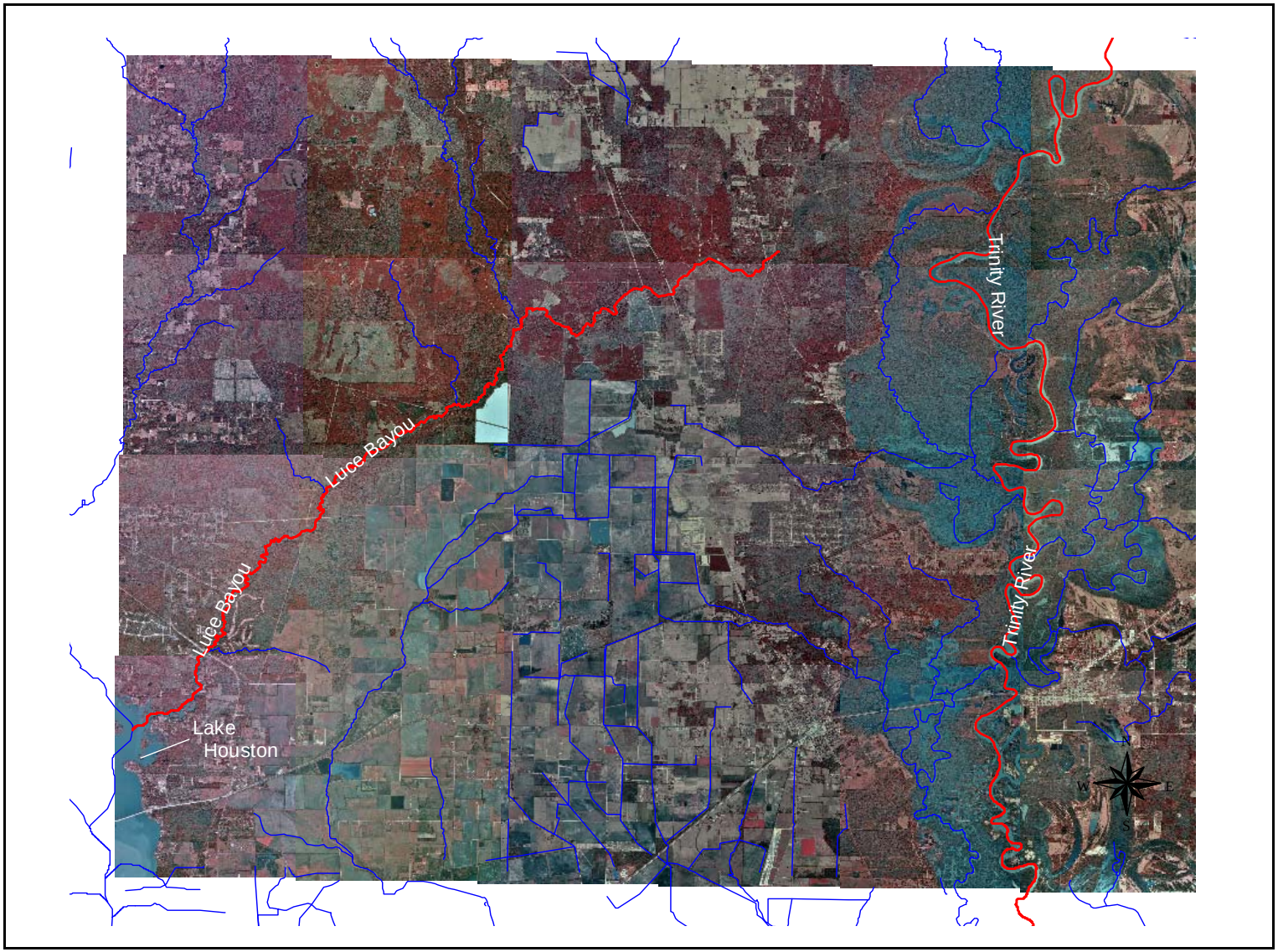
Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
826	980	878	1047	2443	1965	333	102	394	2988	1416	862



LUCE BAYOU
INTERBASIN TRANSFER
TRINITY TO SAN JACINTO

FIGURE 1


Trinity River
Luce Bayou
Luce Bayou
Trinity River
Lake
Houston
W
E
S

STRATEGY: San Jacinto River Authority/City of Houston Contract

SPONSOR: San Jacinto River Authority, City of Houston

SUMMARY

DESCRIPTION: This contractual transfer would consist of a water exchange between the San Jacinto River Authority (SJRA) and the City of Houston that would allow the SJRA to capture the City of Houston's water supplies within Lake Conroe so as to meet the SJRA Northern region water needs. In exchange, the SJRA would transfer a like quantity of water supplies from either or both of the SJRA San Jacinto run-of-river and/or Trinity River water supplies.

Lake Conroe has water rights associated with its water that is owned by the SJRA (32,921 acre-feet per year) and the City of Houston (67,029 acre-feet per year). The City of Houston owns all of the water rights within Lake Houston (168,000 acre-feet per year) and the SJRA owns the 55,000 acre-feet per year of run-of-river water rights that are diverted at Lake Houston. Additionally, SJRA owns 56,000 acre-feet per year of Trinity River water rights that are diverted at the Coastal Water Authority (CWA) canal. Therefore, the SJRA has a total of 143,921 acre-feet per year of surface water rights.

COST: Unknown, potentially zero

STARTING DECADE: 2000

QUANTITY OF WATER: 67,029 acre-feet per year

SUPPLY SOURCE: Lake Conroe

ISSUES AFFECTING FEASIBILITY: Use of this strategy will reduce the quantity of instream flows in the segment of the West Fork San Jacinto River between Lake Conroe and Lake Houston. There are two USGS gage stations located on the West Fork San Jacinto River near the City of Conroe, one downstream of Lake Conroe (USGS gage # 08067650) and one further downstream (USGS gage # 08068000). There is also a USGS gage station on the West Fork San Jacinto River upstream of Lake Houston near the City of Porter (USGS gage # 08068090). Monthly median flows, monthly minimums, and monthly maximums (cfs) from these gages for the period of record are reported below:

Monthly median flows (cfs) as reported from USGS gage # 08067650 downstream of Lake Conroe near Conroe, TX (1972 to current year):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
73	236	19.5	4.35	12	2.5	0.92	0.60	1.6	3.4	8.2	100

Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	0	0.16	0	0	0	0	0	0	0

Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1776	1349	856	1815	1899	1143	231	124	820	601	3003	1023

Monthly median flows (cfs) as reported from USGS gage # 08068000 near Conroe, TX (July 1939 to current year):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
192	241	156	114	122	66	34	26	30	32	60	136

Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
19.7	22.5	20.4	26.0	18.9	15.4	11.2	7.96	6.3	8.1	10.4	21.5

Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3360	3258	2319	5446	4153	3086	977	1899	1945	7836	6834	3484

Monthly median flows (cfs) as reported from USGS gage # 08068090 upstream of Lake Houston near Porter, TX (May 1984 to current year):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
348	394	245	134	130	102	52.5	44	45	47	101	236

Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
41.5	37.8	34.2	60.7	59.4	31.8	17.2	16.1	23.3	22.2	29.8	42.7

Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3199	3763	2041	2229	2174	3169	535.9	222.5	323.3	10908	8244	1881

Reductions in instream flows will likely cause alteration/loss of aquatic habitat and may impact aquatic organisms as well as riparian habitats. Several rare species may be found in Montgomery County, including:

American Peregrine Falcon (State Endangered/Federally Delisted)
Arctic Peregrine Falcon (State Threatened/Federally Delisted)
Bachman's Sparrow (Federal Species of Concern/State Threatened)
Bald Eagle (State and Federally Threatened)
Swallow-tailed Kite (Federal Species of Concern/State Threatened)
Henslow's Sparrow (State Species of Concern)
Red-cockaded Woodpecker (State and Federally Endangered)
White-faced Ibis (Federal Species of Concern/State Threatened)

Wood Stork (Federal Species of Concern/State Threatened)
Creek Chubsucker (Federal Species of Concern/State Threatened)
Paddlefish (Federal Species of Concern/State Threatened)
Plains Spotted Skunk (State Species of Concern)
Rafinesque's Big-eared Bat (Federal Species of Concern/State Threatened)
Southeastern Myotis (State Species of Concern)
Alligator Snapping Turtle (Federal Species of Concern/State Threatened)
Timber Rattlesnake (Federal Species of Concern/State Threatened)
Texas Garter Snake (State Species of Concern)
Louisiana Pine Snake (Federal Candidate for listing/State Threatened)
Correll's False Dragonhead (State Species of Concern)

STRATEGY: San Jacinto River Authority/Lake Livingston Diversion

SPONSOR: San Jacinto River Authority

SUMMARY

DESCRIPTION: This strategy involves diverting flows from Lake Livingston into the West Fork San Jacinto River, which will then be conveyed into Lake Conroe. From Lake Conroe, these supplies will be used to either serve the San Jacinto River Authority (SJRA) Northern basin demands or can be conveyed through the SJRA East Canal and Highlands system to meet water needs within the SJRA Southern basin. The assumption is that the SJRA will secure approximately 75,000 acre-feet per year from a water source within the Trinity basin.

This strategy is an interbasin transfer and as such will be subject to the junior water rights provision of Senate Bill 1. The needed conveyance system would consist of the following facilities:

1) a raw water intake in Lake Livingston near the Town of Point Blank
2) a raw water pump station (70 mgd capacity)
3) approximately 30 miles of 60-inch transmission main

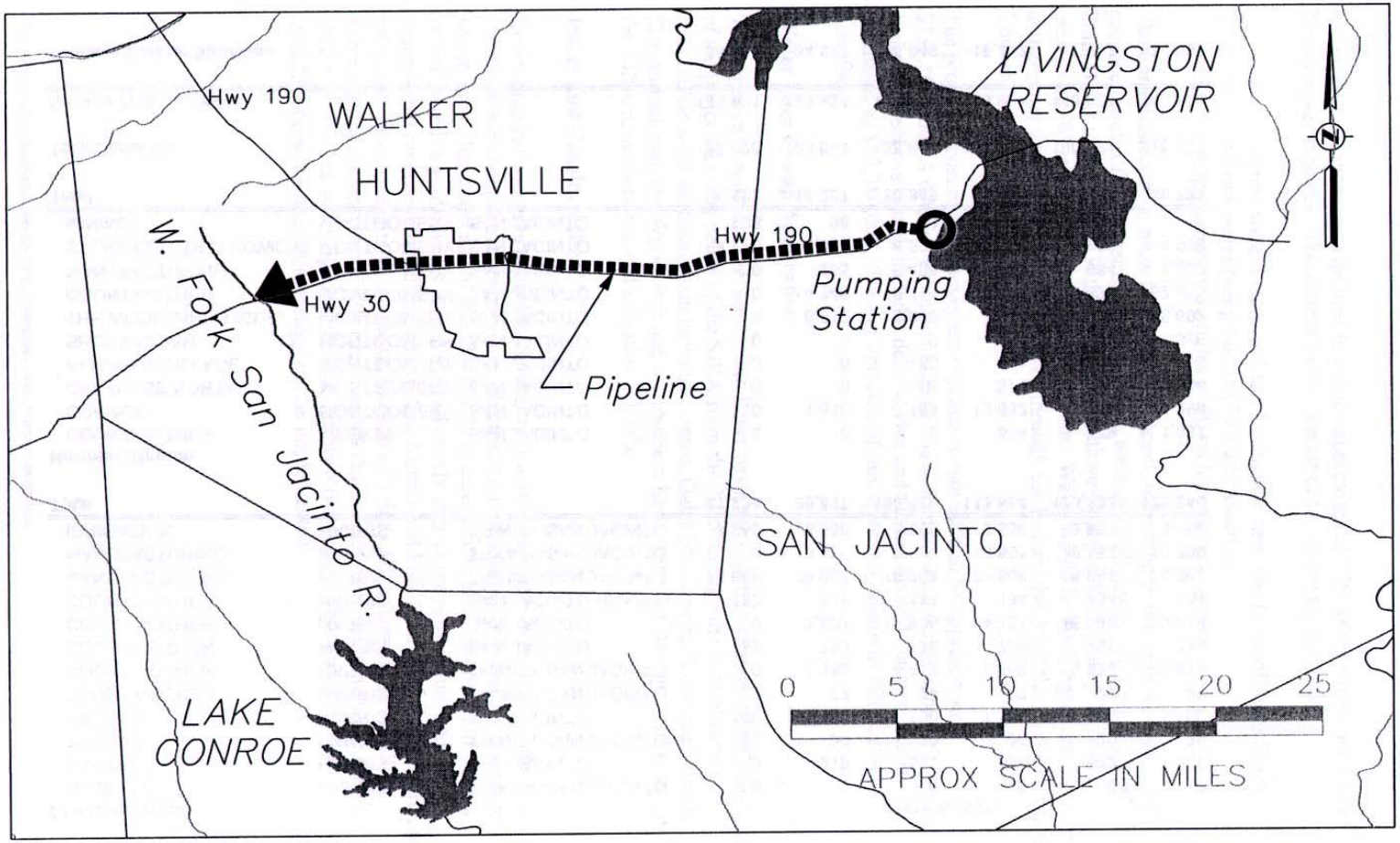
COST: $133,800,000

STARTING DECADE: 2030

QUANTITY OF WATER: 75,000 acre-feet per year

SUPPLY SOURCE: Trinity River water supplies

ISSUES AFFECTING FEASIBILITY: Environmental concerns related to this project include construction within the upper West Fork San Jacinto River channel and rectification of some segment of the river will likely be required. Increased use of stored water from Lake Livingston may result in periodic or prolonged low lake levels. This strategy (as well as many others) would decrease freshwater inflows to the Trinity Bay estuary as water will be leaving the Trinity River Basin.



LAKE LIVINGSTON TO LAKE CONROE
INTERBASIN TRANSFER

FIGURE 1

STRATEGY: Trinity River Authority/City of Houston Contract Agreement

SPONSOR: Trinity River Authority, City of Houston

SUMMARY

DESCRIPTION: The Trinity River Authority (TRA) is projected to have uncommitted surface water supplies (255,392 acre-feet per year) from their water rights within the Lake Livingston-Wallisville Salt Water Barrier system through 2050. This water supply exists as stored water within Lake Livingston. Through financial considerations associated with the 1964 construction contract for the Lake Livingston-Wallisville Salt Water Barrier project, the City of Houston has a preferred position relative to purchase of uncommitted water supplies from TRA's share of the Livingston-Wallisville system.

Diversion of these water supplies can occur either directly from Lake Livingston or at any point downstream of Lake Livingston. Two potential diversion points and conveyance routes include use of the existing Coastal Water Authority (CWA) canal system at the Trinity River Pump Station and/or a new potential route from the Trinity River to Lake Houston via Luce Bayou. If the Luce Bayou system is required to provide supply to the proposed Northeast Water Purification Plant (as is discussed under the Luce Bayou Diversion plan earlier in this document), then the CWA canal system would have sufficient excess capacity because previously utilized Lake Livingston flows would be diverted into Luce Bayou thereby freeing up capacity to convey up to 200,000 acre-feet per year.

COST: Unknown

STARTING DECADE: after 2030

QUANTITY OF WATER: up to 200,000 acre-feet per year

SUPPLY SOURCE: Trinity River water supplies

ISSUES AFFECTING FEASIBILITY: Additional transfer of Trinity River water supplies into the San Jacinto River basin will decrease freshwater inflows into the Trinity Bay estuary and may negatively impact wetland, aquatic, and riparian habitats. Several rare species may be found in Liberty and/or Chambers County, including:

American Peregrine Falcon (State Endangered/Federally Delisted)
Arctic Peregrine Falcon (State Threatened/Federally Delisted)
Bachman's Sparrow (Federal Species of Concern/State Threatened)
Bald Eagle (State and Federally Threatened)
Interior Least Tern (State and Federally Endangered)
Piping Plover (State and Federally Endangered)
Swallow-tailed Kite (Federal Species of Concern/State Threatened)
Henslow's Sparrow (State Species of Concern)

Red-cockaded Woodpecker (State and Federally Endangered)
White-faced Ibis (Federal Species of Concern/State Threatened)
Wood Stork (Federal Species of Concern/State Threatened)
Plains Spotted Skunk (State Species of Concern)
Rafinesque's Big-eared Bat (Federal Species of Concern/State Threatened)
Southeastern Myotis (State Species of Concern)
Alligator Snapping Turtle (Federal Species of Concern/State Threatened)
Timber Rattlesnake (Federal Species of Concern/State Threatened)
Texas Diamondback Terrapin (State Species of Concern)
Atlantic Hawksbill Sea Turtle (State and Federally Endangered)
Green Sea Turtle (State and Federally Threatened)
Gulf Saltmarsh Snake (State Species of Concern)
Kemp's Ridley Sea Turtle (State and Federally Endangered)
Leatherback Sea Turtle (State and Federally Endangered)
Loggerhead Sea Turtle (State and Federally Threatened)
Smooth Green Snake (Federal Species of Concern/State Threatened)
Corkwood (State Species of Concern)
Scarlet Catchfly (State Species of Concern)
Texas Windmill-grass (State Species of Concern)

Instream flows downstream of the CWA canal diversion point will also decrease as a result of additional transfers. The Coastal Water Authority's diversion point is located downstream of the City of Dayton. There is a USGS gage station (gage #08067000) on the Trinity River near the City of Liberty; however, there are no USGS gages downstream of the CWA diversion point. Monthly median flows, monthly minimums, and monthly maximums (cfs) from the gage near the City of Liberty for the period of record are reported below:

Monthly median flows (cfs) as reported from USGS gage # 08067000 near Liberty, TX (October 1940 to current year):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
19300	19000	20050	23650	21000	21800	14100	10000	9140	22750	20400	17000

Monthly Minimum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
20317	10769	5139	21685	8311	14490	9135	---	---	26320	16912	14005

Monthly Maximum (cfs):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
55526	42183	47913	31300	56261	31591	9135	---	---	26320	31800	29416

STRATEGY: Bedias Reservoir – SJRA Interbasin Transfer

SPONSOR: San Jacinto River Authority, Trinity River Authority

SUMMARY

DESCRIPTION: This strategy consists of defining the facilities necessary to impound and transport water supplies from the Trinity River basin to the upper San Jacinto River basin. The impoundment of water in the Trinity River basin involves the construction of Bedias Creek Reservoir by TRA and SJRA. The SJRA will require additional facilities to convey a portion of the created supplies into the West Fork of the San Jacinto River for use by SJRA. A transmission system, consisting of the following, was defined to convey approximately 75,000 acre-feet per year:

1) A raw water intake at the southeast end of the dam
2) A raw water pump station (70 mgd capacity)
3) Approximately 15 miles of 60-inch transmission main
4) Approximately 2 miles of channel improvements to Mock Branch (tributary to the West Fork San Jacinto River), where water will be discharged for conveyance to Lake Conroe.

COST: $194,340,000

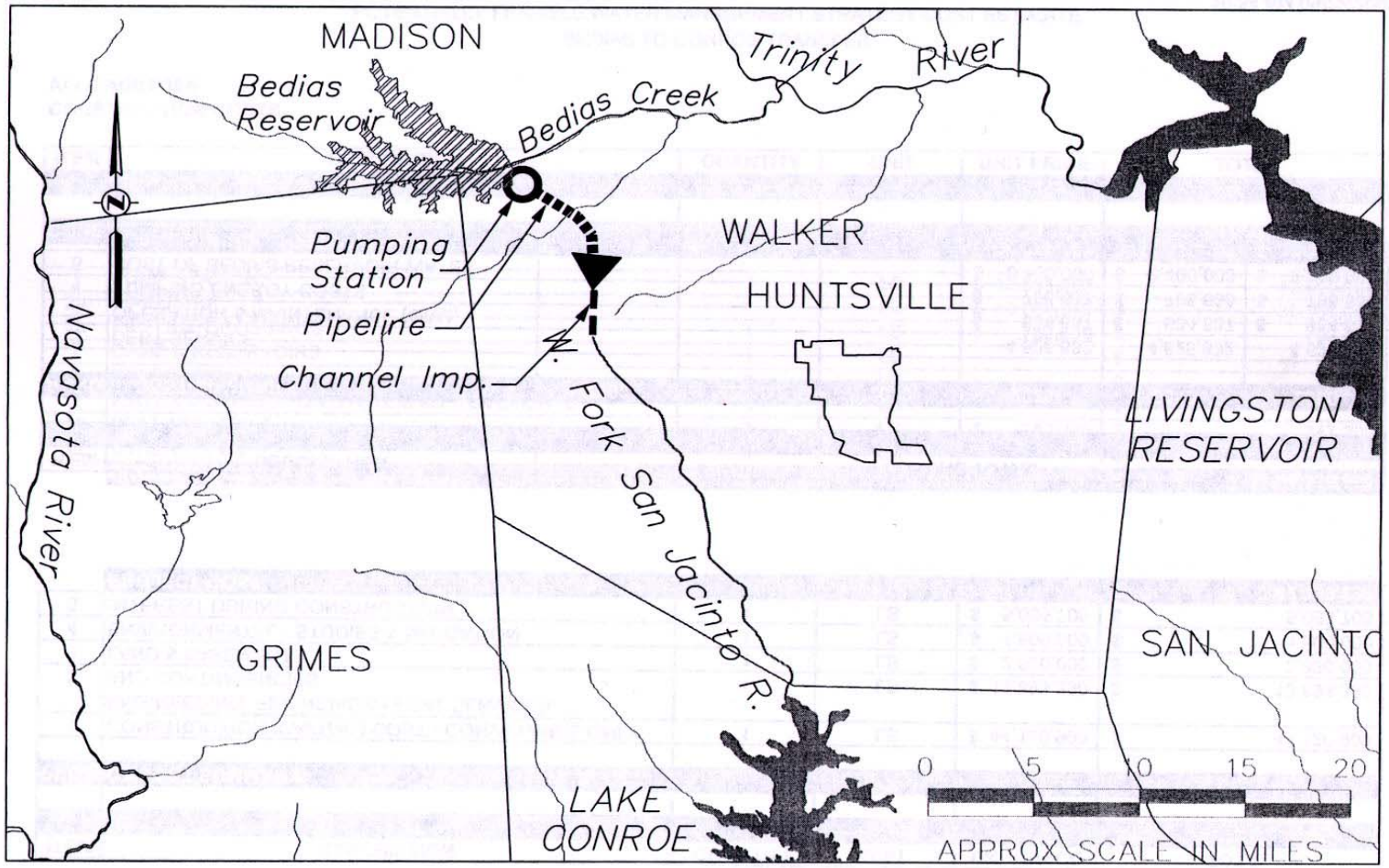
STARTING DECADE: 2030

QUANTITY OF WATER: 90,700 acre-feet per year
75,000 acre-feet per year to SJRA
15,700 acre-feet per year to TRA

SUPPLY SOURCE: Bedias Creek Reservoir (to be created)

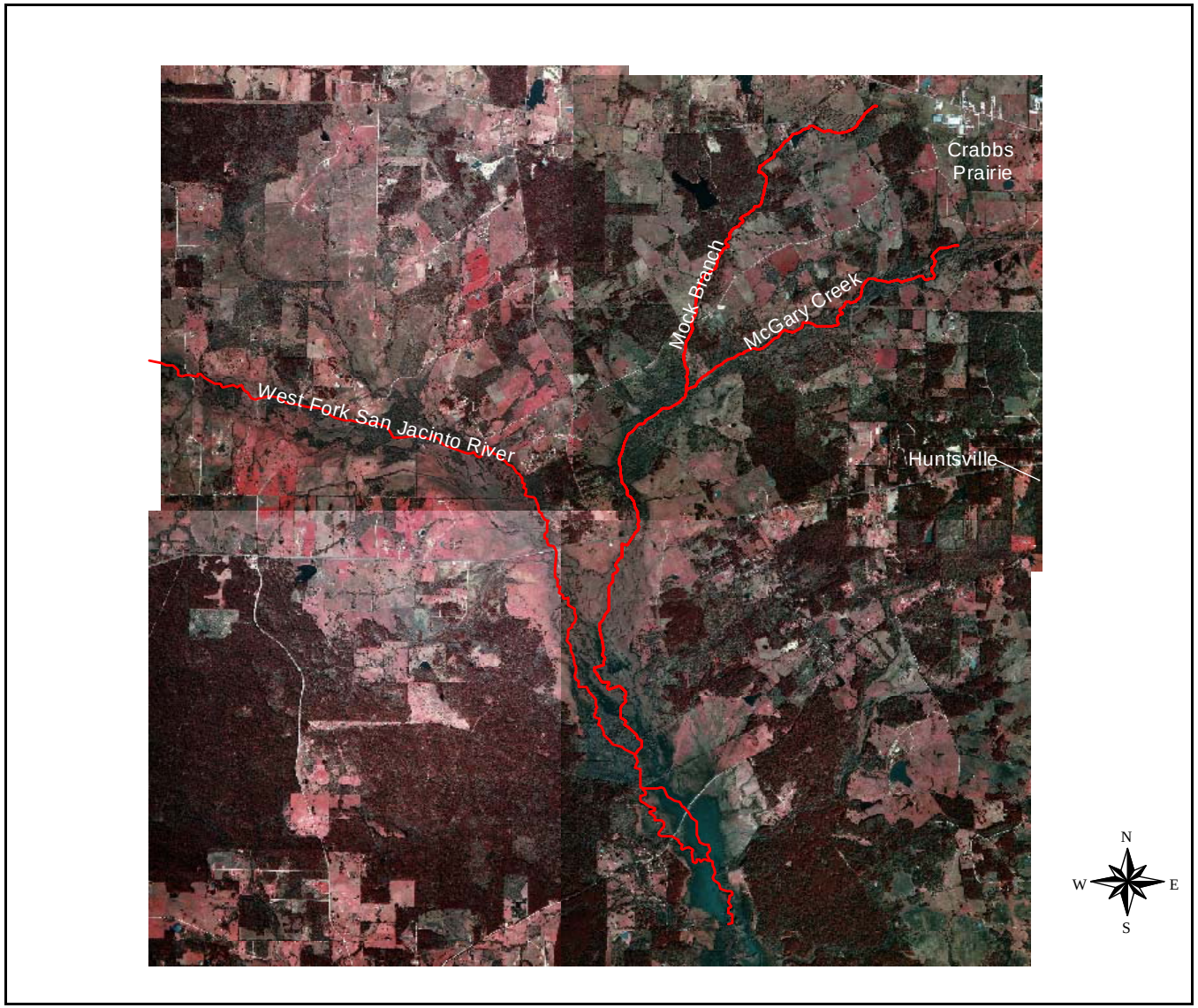
ISSUES AFFECTING FEASIBILITY: Issues related to the construction of Bedias Reservoir were discussed previously. The transfer of water to the San Jacinto River basin will require rectification of Mock Branch and may require rectification of some segment of McGary Creek and the West Fork San Jacinto River, which will affect aquatic, riparian, and wetland habitats. Increased flows in Mock Branch as well as McGary Creek and the West Fork San Jacinto River may also negatively impact these habitats and the aquatic community. Pipeline construction will have impacts to terrestrial, wetland, and aquatic habitats. This project will also likely decrease freshwater inflows to the Trinity River estuary as water is leaving the Trinity basin.

*No mention is made of McGary Creek in the Environmental Concerns section related to this project within the Region H water plan.



BEDIAS RESERVOIR TO LAKE CONROE
INTERBASIN TRANSFER

FIGURE 1


Crabbs
Prairie
Mock Branch
McGary Creek
West Fork San Jacinto River
Huntsville
N
W
E
S

STRATEGY: Gulf Coast Water Authority/City of Houston Contract

SPONSOR: Gulf Coast Water Authority, City of Houston, Coastal Water Authority

SUMMARY

DESCRIPTION: Under this strategy the Gulf Coast Water Authority (GCWA) will purchase Trinity River water from the City of Houston and convey that water from the Coastal Water Authority (CWA) Bayport Reservoir to the Texas City Reservoir owned by the GCWA. This will require the development of a conveyance system between the reservoirs, which was defined to consist of the following:

1) A raw water pump station (25 mgd capacity)
2) Approximately 16 miles of 36-inch transmission main
3) Two channel crossings at Clear Lake and Dickinson Bayou

COST: $63,270,000

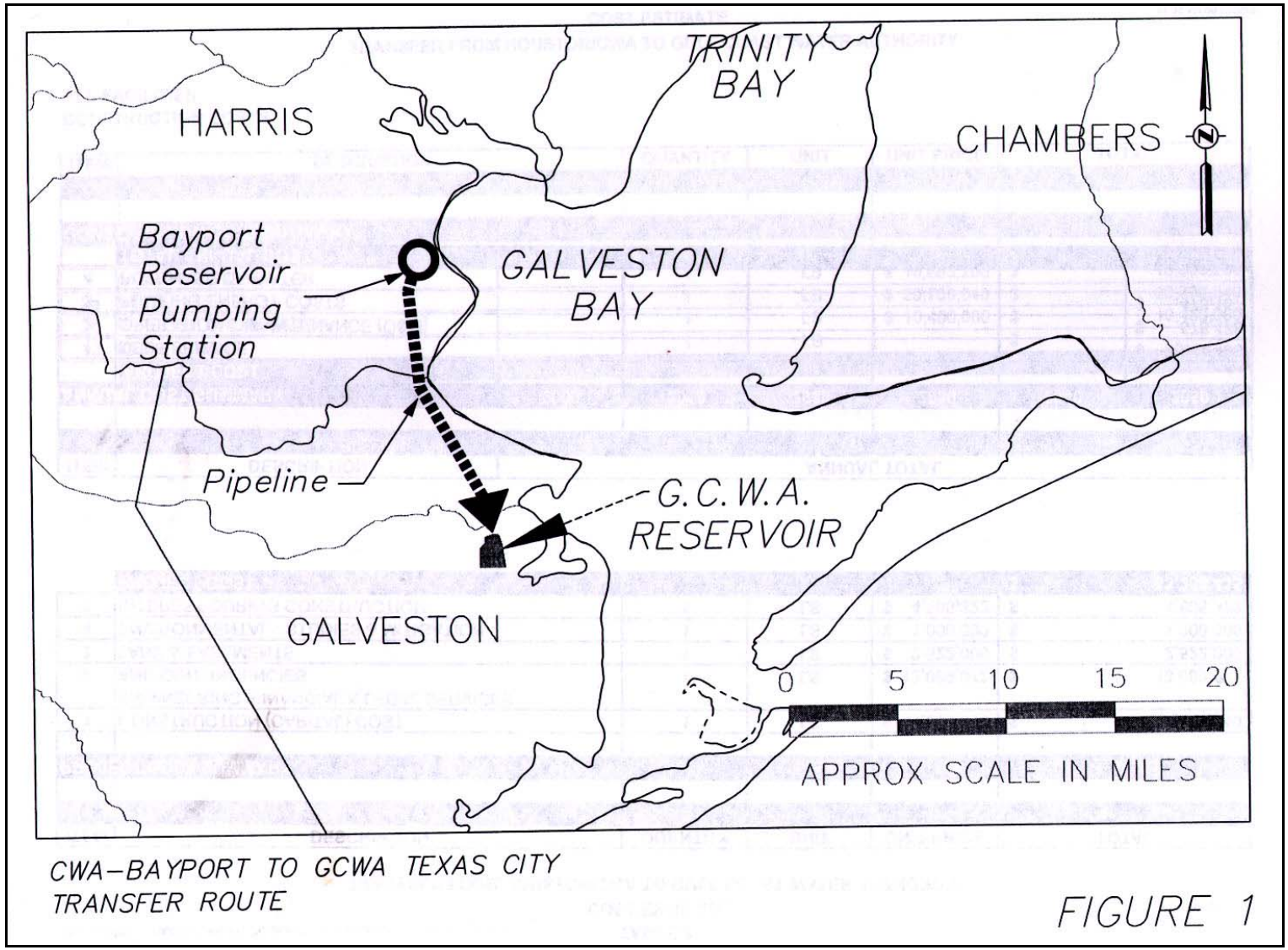
STARTING DECADE: 2040

*this strategy may be initiated earlier to allow the GCWA to allocate more of its Brazos River supplies to Fort Bend and Brazoria County WUG demands.

QUANTITY OF WATER: 23,000 acre-feet per year

SUPPLY SOURCE: City of Houston (Trinity River water supplies)

ISSUES AFFECTING FEASIBILITY: While the ultimate outfall of this water still remains in the Galveston Bay estuary, the timing and location of the freshwater inflow will be altered. The inflow would be moved from Upper Trinity Bay to western Galveston Bay. From the description of this project in the Region H water plan it is not clear how the water will be conveyed from the Trinity River to the Bayport Reservoir.



CWA–BAYPORT TO GCWA TEXAS CITY TRANSFER ROUTE

FIGURE 1

STRATEGY: Sabine River to Region H Interbasin Transfer

SPONSOR: SJRA, BRA, GCWA, and the City of Houston

SUMMARY

DESCRIPTION: Under this strategy surplus raw water supplies in the Sabine Basin would be transferred to the major water providers within the San Jacinto Basin (the City of Houston and the San Jacinto River Authority) and in the Brazos River Basin (the Brazos River Authority and the Gulf Coast Water Authority) that have projected supply deficits. Water will be pumped from the Sabine River upstream of the City of Orange and conveyed via Sabine River Authority canals to the Lower Neches Valley Authority (LNVA) canal system at the LNVA First Lift Pumping Station north of Beaumont. LNVA canals will carry the flow west and discharge it into the Trinity River upstream of the Coastal Water Authority Trinity River Pumping Station. New canals, pumping stations, and pipelines will need to be constructed where it is not feasible to use existing facilities.

The Region H plan surmises that with Sabine River water to replenish the lower Trinity water, additional withdrawals can be made from Lake Livingston. An integral part of this strategy is a pipeline from Lake Livingston discharging into Rocky Creek. Rocky Creek is a tributary to the Navasota River downstream of Gibbons Creek Lake and the Navasota empties into the Brazos River. This transfer would supply the projected BRA and GCWA shortfalls in Region H.

The City of Houston's supply deficits would be alleviated by delivery of Sabine River water to the Trinity River upstream of the existing CWA Trinity River Pumping Station near Dayton. The TRPS will pump the water to CWA's Lynchburg Reservoir from which it will be distributed to the City of Houston's East and Southeast Water Purification Plants.

Delivery of Sabine River water to the lower Trinity River would allow SJRA to take their 56,000 acre-feet per year from Lake Livingston, instead of the current method of pumping Trinity River water through the CWA canal system that supplies the Lynchburg Reservoir. However, the SJRA has a projected additional shortfall of 18,600 acre-feet per year. The SJRA will need to exchange this amount of Sabine water delivered to the lower Trinty River for an equivalent quantity of water in Lake Livingston. The 74,600 acre-feet per year of water needed can then be delivered to the upper reaches of the West Fork San Jacinto River via Lake Livingston to Rocky Creek pipeline described above.

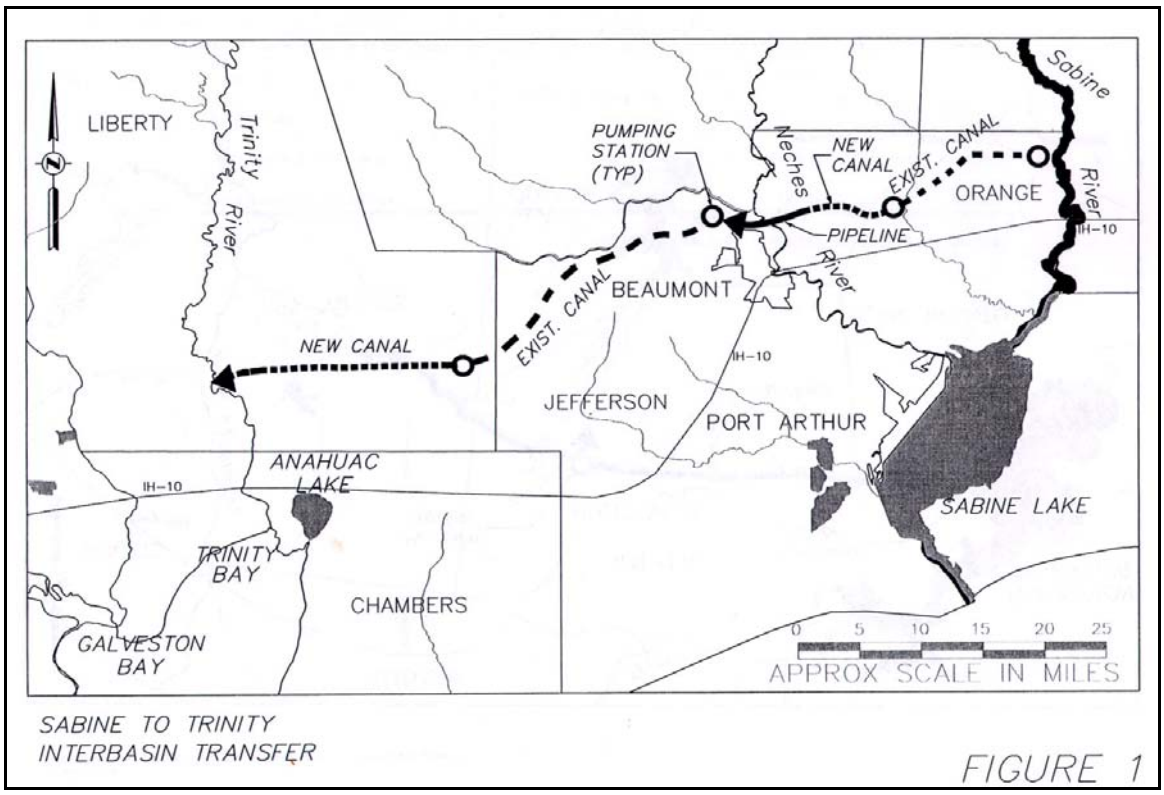
COST: $809,944,000

STARTING DECADE: 2010

QUANTITY OF WATER: 101,500 acre-feet per year in 2010, increasing to 453,100 acre-feet per year by 2050

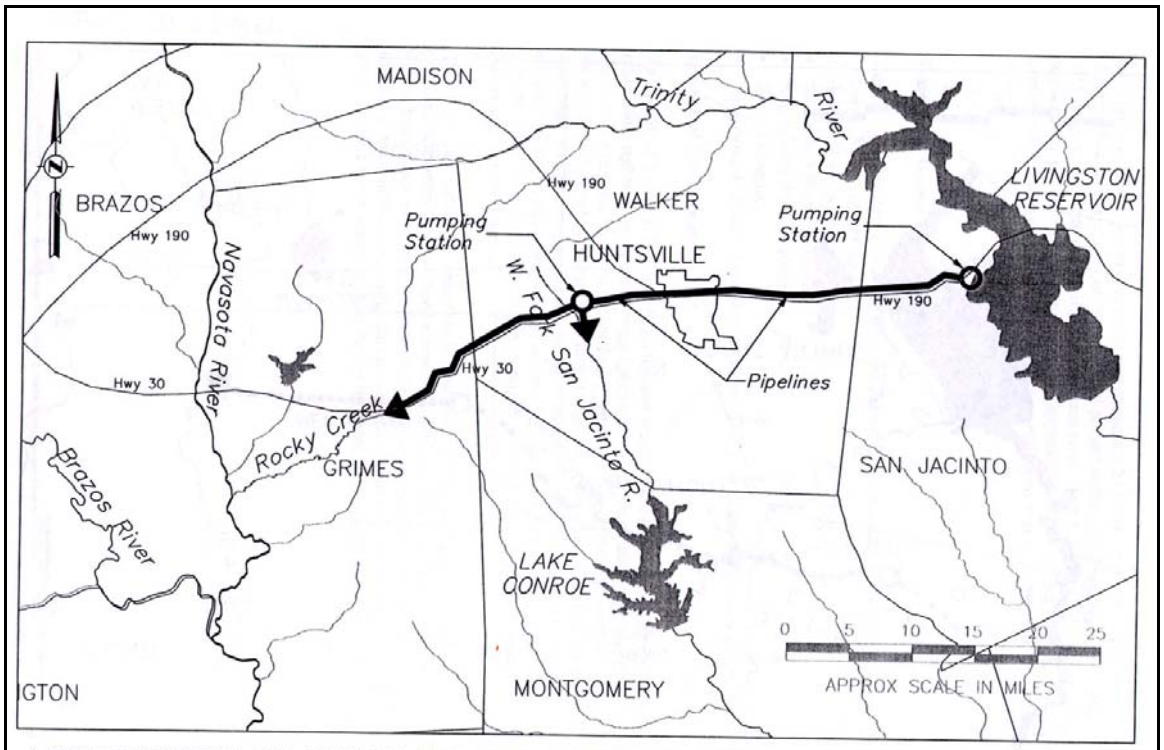
SUPPLY SOURCE: Sabine River

ISSUES AFFECTING FEASIBILITY: The transfer of this quantity of water out of the Sabine River Basin will significantly reduce freshwater inflows to the Sabine Lake estuary. This strategy will require further study to fully assess the potential ecological effects on the estuary. Also, the State of Louisiana and local Sabine Lake interests have historically voiced concern about a large-scale water transfer of this type.



SABINE TO TRINITY
INTERBASIN TRANSFER

FIGURE 1



LAKE LIVINGSTON TO BRAZOS AND SAN JACINTO RIVERS
INTERBASIN TRANSFER

FIGURE 2

Other Potential Water Management Strategies for Region H

1) Municipal Water Conservation
2) Irrigation Conservation
3) Wastewater Reclamation/Reuse
4) Desalination

Appendix 7D

Estimated Municipal Return Flows and Recommended Reuse

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Table 7D-1
Estimated Municipal Return Flows
and Recommended Reuse

	Municipal Water Demand							Estimated Municipal Return Flow						
	2000	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
								60%	58%	56%	54%	52%	50%	50%
Counties														
Austin County	3,535	3,918	4,258	4,494	4,590	4,639	4,756	2,121	2,272	2,384	2,427	2,387	2,320	2,378
Brazoria County	40,127	44,685	50,822	56,754	62,022	68,202	74,967	24,076	25,917	28,460	30,647	32,251	34,101	37,484
Chambers County	3,908	4,625	5,438	6,180	6,824	7,506	8,249	2,345	2,683	3,045	3,337	3,548	3,753	4,125
Fort Bend County	67,566	89,579	111,680	138,770	165,904	202,470	245,404	40,540	51,956	62,541	74,936	86,270	101,235	122,702
Galveston County	44,544	46,090	47,390	47,818	47,487	47,393	47,641	26,726	26,732	26,538	25,822	24,693	23,697	23,821
Harris County	598,596	677,684	756,765	834,747	915,339	999,189	1,089,188	359,158	393,057	423,788	450,763	475,976	499,595	544,594
Leon County	1,880	2,122	2,364	2,475	2,441	2,400	2,422	1,128	1,231	1,324	1,337	1,269	1,200	1,211
Liberty County	9,350	10,283	11,370	12,401	13,455	14,670	16,176	5,610	5,964	6,367	6,697	6,997	7,335	8,088
Madison County	1,728	1,792	1,864	1,918	1,952	2,007	2,072	1,037	1,039	1,044	1,036	1,015	1,004	1,036
Montgomery County	51,193	68,638	90,346	111,441	133,994	164,466	200,243	30,716	39,810	50,594	60,178	69,677	82,233	100,122
Polk County (P)	4,489	4,859	5,230	5,486	5,662	5,913	6,205	2,693	2,818	2,929	2,962	2,944	2,957	3,103
San Jacinto County	2,698	3,161	3,622	3,972	4,158	4,262	4,329	1,619	1,833	2,028	2,145	2,162	2,131	2,165
Trinity County (P)	1,126	1,203	1,260	1,255	1,206	1,145	1,102	676	698	706	678	627	573	551
Walker County	14,741	16,512	17,941	18,516	18,146	18,097	18,097	8,845	9,577	10,047	9,999	9,436	9,049	9,049
Waller County	4,610	5,393	6,310	7,380	8,530	10,016	11,757	2,766	3,128	3,534	3,985	4,436	5,008	5,879
Total Estiamted Return Flows								510,055	568,716	625,330	676,948	723,689	776,188	866,304
WUGs with Reuse WMS														
Houston	347,947	389,082	429,218	467,036	506,047	547,787	593,096	208,768	225,668	240,362	252,199	263,144	273,894	296,548
NHCRWA*	84,688	105,222	125,345	144,658	164,688	184,093	204,726	50,813	61,029	70,193	78,115	85,638	92,047	102,363
San Jacinto River Basin (total for all counties)	624,574	729,390	836,721	942,974	1,052,402	1,175,695	1,311,993	374,744	423,046	468,564	509,206	547,249	587,848	655,997
Reuse WMS														
Houston-Direct Reuse								0	0	67,200	67,200	67,200	67,200	67,200
Houston-Indirect Reuse								0	0	0	0	0	98,045	98,045
Houston-Total Reuse								0	0	67,200	67,200	67,200	165,245	165,245
NHCRWA-Indirect Reuse														31,400
SJRA-Indirect Reuse								0	14,944	14,944	14,944	14,944	14,944	14,944
Total Estimated Reuse								0	14,944	82,144	82,144	82,144	180,189	211,589
Harris County-Net Return Flow**								359,158	393,057	356,588	383,563	408,776	334,350	347,949
San Jacinto Basin - Net Return Flow								374,744	408,102	386,420	427,062	465,105	407,659	444,408

* includes Jersey Village and Tomball (member cities)
**excludes SJRA reuse from Montgomery County

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APPENDICES

8. Ecologically Unique Stream Segments, Unique Reservoir Sites and Legislative Recommendations

8.1 Introduction

Chapter 31 TAC 357.7 (a)(10) of the Texas Water Code specifies that the regional water plan shall include recommendations on regulatory, administrative, or legislative issues that the regional water planning group believes to be needed facilitate the orderly development, management, and conservation of water resources and preparation for and response to drought conditions in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of the state and regional water planning area. Further more, Chapters 31 TAC 357.8 and 31 TAC 357.9 of the Texas Water Code specify that each regional water planning group throughout Texas shall make recommendations as to which streams (all or parts), if any, can be classified as unique (unique ecological value) within the region along with unique sites for reservoir construction. This chapter presents the recommendations, made by the RHWPG, relating to these chapters of the Texas Water Code.

The RHWPG believes that stewardship of the environment can be coupled with water supply development. Successful planning and implementation of these recommendations will serve to enhance the quality of life and sustain the local economy throughout the water planning area.

8.2 Unique Stream Segments

The Texas Water Code offers the opportunity to identify river and stream segments of unique ecological value within a planning region. The criteria codified in the Texas Administrative Code are as follows:

> **31 TAC § 357.8 Ecologically Unique River and Stream Segments**
>
> (a) Regional water planning groups may include in adopted regional water plans recommendations for all or parts of river and stream segments of unique ecological value located within the regional water planning area by preparing a recommendation package consisting of a physical description giving the location of the stream segment, maps, and photographs of the stream segment and a site characterization of the stream segment documented by supporting literature and data. The recommendation package shall address each of the criteria for designation of river and stream segments of ecological value found in subsection (b) of this section. The regional water planning group shall forward the recommendation package to the Texas Parks and Wildlife Department and allow the Texas Parks and Wildlife Department 30 days for its written evaluation of the recommendation. The adopted regional water plan shall include, if available, Texas Parks and Wildlife Department's written evaluation of each river and stream segment recommended as a river or stream segment of unique ecological value.
>
> (b) A regional water planning group may recommend a river or stream segment as being of unique ecological value based upon the following criteria:
>
> (1) biological function - stream segments which display significant overall habitat value including both quantity and quality considering the degree of biodiversity, age,

> and uniqueness observed and including terrestrial, wetland, aquatic, or estuarine habitats;
>
> (2) hydrologic function - stream segments which are fringed by habitats that perform valuable hydrologic functions relating to water quality, flood attenuation, flow stabilization, or groundwater recharge and discharge;
>
> (3) riparian conservation areas - stream segments which are fringed by significant areas in public ownership including state and federal refuges, wildlife management areas, preserves, parks, mitigation areas, or other areas held by governmental organizations for conservation purposes, or stream segments which are fringed by other areas managed for conservation purposes under a governmentally approved conservation plan;
>
> (4) high water quality/exceptional aquatic life/high aesthetic value - stream segments and spring resources that are significant due to unique or critical habitats and exceptional aquatic life uses dependent on or associated with high water quality; or
>
> (5) threatened or endangered species/unique communities - sites along streams where water development projects would have significant detrimental effects on state or federally listed threatened and endangered species, and sites along streams significant due to the presence of unique, exemplary, or unusually extensive natural communities.

The significance of streams of unique ecological value is defined in the Texas Water Code, 16.051:

> The legislature may designate a river or stream segment of unique ecological value. This designation solely means that a state agency or political subdivision of the state may not finance the actual construction of a reservoir in a specific river or stream segment designated by the legislature under this subsection.

Texas Parks and Wildlife Department (TPWD) provided the Region H Water Planning Group with the document "Ecologically Significant River and Stream Segments of Region H Regional Water Planning Area" (Norris and Linam, October 1999) that detailed information on streams in the region. Two hundred fifty-nine (259) streams were identified that exist within Region H. TPWD selected twenty-seven (27) for inclusion as "ecologically significant" streams. This analysis served as the basis for further consideration of which streams might be of "unique ecological value." In 2003, TPWD updated their recommendations list, adding 2 streams. Members of the RHWPG nominated two tributaries of Galveston Bay as unique due to high aesthetic value. Finally, the Houston Sierra Club submitted nominations for 18 stream segments within the Region, nine of which coincided with previously mentioned nominations.

The RHWPG considered all 40 nominated stream segments, using the following described methodology to make a final selection.

Methodology:

> (1) Screened 40 nominated streams based on data provided by Texas Parks and Wildlife Department and other sources (see Table 8-1) using a decision rule of selecting those streams with six or more criteria factors cited by the TPWD.

(2) Compared screened streams with previously studied reservoir sites and published or potential water conveyance plans and eliminated streams that might conflict with potential water development projects.

(3) Compared screened streams with TCEQ water rights and wastewater discharge information and identified streams that might raise water quality permitting issues.

(4) Compared screened streams with Bayou Preservation Association and Houston Canoe Club ranking of streams in the region and other recreational use information.

(5) Compared screened streams with riparian conservation areas and public lands, adding segments entirely within conservation areas and narrowing the recommendations to only those segments bordered by public lands.

Table 8-1: Streams Considered for Recommendation as Unique

River or Stream Segment	County	Biological Function	Hydrologic Function	Riparian Conservation Area	High Water Quality/ Aesthetic Value	Endangered/ Threatened Species	Conveyance Project/ Proposed Reservoir Site	Water Rights	WW Outfall	Recommended in the 2001 Plan
Considered in 2001 Regional Plan:										
Armand Bayou	Harris	x	xx	xx	x			x	xx	x
Austin Bayou	Brazoria	x	x	xx		xxx		xx		
Bastrop Bayou	Brazoria	x	x	xx		xxx		x		x
Big Creek	Fort Bend	x	x	xx	xx			x[1]	x	x
Big Creek	San Jacinto	x		xxx	x	x		R	x	x
Brazos River	Austin/Waller/Brazoria/Fort Bend	x	xxx	xxx		xx	x	xx	xx	
Caney Creek	Walker/ Harris	x	xx	xx					x[3]	
Carpenters Bayou	Harris	x	xx	x				x[1]	xx	
Cedar Lake Creek	Brazoria	x	xx	xx		xxxx		x[2]		x
Clear Creek	Waller	x	xx		x			R		
East Fork San Jacinto River	Walker/Harris/San Jacinto/Liberty/Montgomery	x	xx	xx	xxx				x[4]	
East Sandy Creek	Walker	x	x	x						
Halls Bayou	Brazoria	x	x			x				
Harmon Creek	Walker	x	xx	x	x			xx	x[5]	
Jones Creek	Brazoria	x	x	xx				x,x[1]		
Lake Creek	Montgomery	x	xx		xxx	x		R	x[6]	
Luce Bayou	Harris/Liberty	x	xx				x	x		
Menard Creek	Polk	x	xx	x		x		R		x
Mill Creek	Austin	x	xx		xx	x			xx[7]	
Nelson Creek	Walker	x	x		xx				x[8]	
Old River	Liberty	x	xx	x	x					
Oyster Bayou	Chambers	x	x	xx				xx		
Redfish Bayou	Brazoria		x	xx				x[1]	x	
San Bernard River	Brazoria/Fort Bend/Austin	x	xx			xx		xx	x[9]	
Upper Trinity River	Walker/Leon/Houston		x			x		xx		
Lower Trinity River	Chambers/Liberty	x	xxx	xxx		xx	E	xx	x[10]	
Upper Keechi Creek	Leon	x	x	x				x		
Wheelock Creek	Leon		x		x					
Winters Bayou	San Jacinto/Walker	x	xx	x	x					
Recommended by Houston Sierra Club (2005):										
Boswell Creek	Walker/San Jacinto	x	x	x	x	xx				
Briar Creek	Walker		x	x						
East Bay Bayou	Chambers		x	x				xx		
Henry Lake Branch	San Jacinto		x	x					x[8]	
Little Lake Creek	Montgomery/Walker		x	x						
Lost River	Chambers/Liberty	x	x	x						
Onion Bayou	Chambers	x	x	x				xx		
West Fork San Jacinto	Walker		x	x			x			
West Sandy Creek	Walker		x	x						
Recommened by RHWPG Members (2005):										
Lone Oak Bayou	Chambers	x	x		x					
Whites Bayou, below IH-10	Chambers/Liberty		x	x	x					

Note: More than one "x" in a criteria column indicates that the river or stream segment satisfies that particular criteria in more than one way. For example, Armand Bayou is a State Costal Preserve and is also a part of the Great Texas Coastal Birding Trail.

More than one"x" in the Water Rights or WW Outfall column mean more than one located on that stream.

1 Water right(s) held by TPWD
2 Water right held by US Fish & Wildlife
3 No outfalls north of State Hwy 105
4 One (1) at I-59 held by San Jacinto River Basin Forest Glen, Inc. WWTP
5 One (1) outfall for Gordon Glass Products
6 No outfalls north of State Hwy 105
7 Two (2) outfalls at State Hwy 36
8 Two (2) outfalls for TxDOT comfort stations
9 No outfalls between I-10 and Austin County Line
10 No outfalls in Chambers County, two (2) in Liberty County for City of Liberty WWTP and Derrigan Manufacturing
11 One (1) at Hwy 150
R - Rec permit w/o diversion
E - existing reservoir or impoundment

After consideration of the above factors, eight streams are recommended for designation as Streams of Unique Ecological Value in Region H. These are illustrated on Figure 8-1: Recommended Unique Stream Segments.

Table 8-2: Recommended Unique Stream Segments

Stream	County
Armand Bayou	Harris
Austin Bayou	Brazoria
Bastrop Bayou	Brazoria
Big Creek	Fort Bend
Big Creek	San Jacinto
Cedar Lake Creek	Brazoria
Menard Creek	Liberty, Hardin*, Polk
Oyster Bayou	Chambers

*Hardin County portion is in Region I

The entire stream segment length is recommended for unique designation status for two of the streams: Armand Bayou and Menard Creek (segments within Region H.) For the remaining four streams, only those portions adjacent to or within the riparian conservation areas are proposed for designation as unique streams.

The following are descriptions of each of these special watercourses.

8.2.1 Armand Bayou[1]

Armand Bayou is a coastal tributary of Clear Lake, a secondary bay in the Galveston Bay System, in southern Harris County. The bayou is often shallow and has a mean width of 40 feet that supports varying flow over a muddy substrate. This scenic natural bayou and associated riparian forest offer habitat for alligators, waterfowl, and other wildlife such as raccoons, bobcats, and river otters. Noteworthy bird species known to inhabit the area include: pileated woodpeckers, red shouldered hawks, barred owls, ospreys, and migratory songbirds. Several hundred acres of restored coastal prairie offer habitat for grassland species such as the sedge wren and Le Conte's sparrow. The associated marshes that border the riparian forest provide valuable habitat to commercially and recreationally important species such as white shrimp, blue crabs, and red drum. In addition, the bayou also provides valuable recreational opportunities to local residents within an urban context. The ecologically significant segment is from the confluence with Clear Lake in Harris County upstream to Genoa-Red Bluff Road in Harris County.

(1) Biological Function- significant riparian zone and associated marshes display significant overall habitat value.

[1] TPWD Report, Norris and Linam, October 1999.

(2) Hydrologic Function- performs valuable hydrologic function relating to flood attenuation for the Pasadena and Clear Lake areas.

(3) Riparian Conservation Area- fringed by the Armand Bayou Coastal Preserve and is a part of the Great Texas Coastal Birding Trail.

(4) High Water Quality/Exceptional Aquatic Life/High Aesthetic Value- high aesthetic value for outdoor recreation within an urban context.

(5) Threatened or Endangered Species/Unique Communities- none identified.

8.2.2 Austin Bayou[2]

Austin Bayou is a scenic coastal plain bayou fringed by native prairie, agricultural land, and woodlands. It begins near Rosharon in north central Brazoria County and flows southeasterly 26 miles into Bastrop Bay. The bayou is narrow (about 25 feet wide) with a limited flow of water and provides valuable habitat for wildlife, and is a recreational resource to local residents. The bayou and associated coastal marsh offer significant habitat for wading birds such as the wood stork, reddish egret and white-faced ibis. Other known inhabitants include white-tailed kites, white-tailed hawks, waterfowl (geese and sandhill cranes), and grassland species (sedge wren, Le Conte's sparrow, and grasshopper sparrow). The ecologically unique segment is that portion of the stream within the Brazoria National Wildlife Refuge (from the confluence with Bastrop Bayou to FM 2004).

(1) Biological Function- coastal stream fringed with native prairie and woodlands that display significant overall habitat value.

(2) Riparian Conservation Area- fringed by the Brazoria National Wildlife Refuge and is part of the Great Texas Coastal Birding Trail.

(3) Threatened or Endangered Species/Unique Communities- designated as an internationally significant shorebird site by the Western Hemisphere Shorebird Reserve Network, provides habitat for the wood stork, reddish egret, and white-faced ibis.

8.2.3 Bastrop Bayou[3]

Bastrop Bayou is a scenic coastal waterway fringed by extensive freshwater wetland habitat. The bayou rises in the central part of Brazoria County and flows deeply in a southeasterly direction for 13 miles where it empties into Austin Bayou and ultimately Bastrop Bay. Like Austin Bayou, Bastrop Bayou provides valuable habitat for endangered or threatened shorebirds as well as waterfowl, grassland species, and birds of prey. These include geese, sandhill cranes, sedge wrens, grasshopper sparrows, white-tailed kites, and white-tailed hawks. In addition to numerous bird watching opportunities, the bayou also provides outdoor opportunities in the form of water related activities to local residents. The ecologically significant segment is that portion within the Brazoria National Wildlife Refuge. This segment is within TCEQ stream segment 1105.

[2] TPWD Report, Norris and Linam, October 1999.
[3] TPWD Report, Norris and Linam, October 1999.

(1) Biological Function- extensive freshwater wetland habitat that displays significant overall habitat value.

(2) Hydrologic Function- extensive freshwater wetlands perform valuable hydrologic function relating to water quality.

(3) Riparian Conservation Area- fringed by the Brazoria National Wildlife Refuge and is part of the Great Texas Coastal Birding Trail.

(4) Threatened or Endangered Species/Unique Communities- designated as an internationally significant shorebird site by the Western Hemisphere Shorebird Reserve Network, provides habitat for the wood stork, reddish egret, and white-faced ibis.

8.2.4 Big Creek (Fort Bend)[4]

Big Creek begins south of Rosenberg and flows southeasterly 25 miles into the Brazos River in Fort Bend County. The creek is an old Brazos River channel with associated sloughs, bayous, oxbow lakes, and coastal prairies that are bordered by bottomland hardwood forest. This habitat provides an excellent opportunity for bird watching, as over 270 species of birds have been sighted in this area. Birds commonly seen here include purple gallinules, least bitterns, prothonotary warblers, barred owls, white-ibis', herons, and egrets among others. Other wildlife that inhabits the area includes alligators, bobcats, raccoons, feral hogs, and gray foxes. The ecologically significant segment is that portion of the stream within the Brazos Bend State Park.

(1) Hydrologic Function- bottomland hardwood forest and associated wetlands perform valuable hydrologic function relating to water quality.

(2) Riparian Conservation Area- fringed by Brazos Bend State Park and is part of the Great Texas Coastal Birding Trail.

(3) High Water Quality/Exceptional Aquatic Life/High Aesthetic Value- designated as an Ecoregion Reference Stream by the TPWD River Studies Program for high dissolved oxygen and diversity of benthic macroinvertebrates.

(4) Threatened or Endangered Species/Unique Communities- none identified.

8.2.5 Big Creek (San Jacinto)[5]

Big Creek rises near Cold Springs in central San Jacinto County and flows southeasterly into northern Liberty County where it joins the Trinity River. The creek is narrow with a sandy bottom, follows a run, riffle, pool sequence, and contains abundant woody debris. This provides habitat for a diverse community of fish and macroinvertebrates including the southern brook lamprey, blacktail shiner, blacktail redhorse, blackstripe topminnow, numerous perch species, and several species of sunfish. The creek meanders through pristine forestland in the Sam Houston National Forest and provides significant opportunities for bird watching and outdoor recreation. Bird species often found include Louisiana waterthrushes and worm-eating warblers, as well as the endangered red-cockaded woodpecker that the

[4] TPWD Report, Norris and Linam, October 1999.
[5] TPWD Report, Norris and Linam, October 1999.

National Forest Service developed an interpretive site around. An interpretive trail through the Big Creek Scenic Area and the Lone Star Hiking Trail provide access to the creek and provide an opportunity to see mammals such as bobcats, squirrels, and beavers. The ecologically significant segment is that portion of the stream that exists within the Sam Houston National Forest within San Jacinto County.

(1) Biological Function- displays significant overall habitat value considering the high degree of biodiversity.

(2) Riparian Conservation Area- fringed by the Sam Houston National Forest and the Big Creek Scenic Area and is part of the Great Texas Coastal Birding Trail.

(3) High Water Quality/Exceptional Aquatic Life/High Aesthetic Value- exceptional aesthetic value.

(4) Threatened or Endangered Species/Unique Communities- red-cockaded woodpecker group nearby.

8.2.6 Cedar Lake Creek[6]

Cedar Lake Creek begins in northwest Brazoria County and flows southeasterly 28 miles into Cedar Lake and ultimately to the Gulf of Mexico. The creek is bordered by bottomland hardwood forest in the northern portion and by interspersed native prairies, farmland, and coastal marshes in the south. It is one of the few remaining unchannelized bayous in the region. The creek itself and the adjacent San Bernard National Wildlife Refuge provide habitat to numerous bird species including the scissor-tailed flycatcher and numerous shorebirds. The ecologically significant segments are those portions of the stream adjacent to the proposed Wildlife Management Area and the San Bernard Wildlife Refuge within Brazoria County.

(1) Biological Function- undredged bayou with extensive forest and wetlands that display significant overall habitat value.

(2) Hydrologic Function- bottomland forest and wetlands perform valuable hydrologic functions relating to flood attenuation and water quality.

(3) Riparian Conservation Area- fringed by San Bernard National Wildlife Refuge and is part of the Great Texas Coastal Birding Trail.

(4) Threatened or Endangered Species/Unique Communities- significant due to presence of reddish egret, wood stork, brown pelican, and white-faced ibis.

8.2.7 Menard Creek[7]

Menard Creek begins east of Livingston in central Polk County and flows southeasterly to the Polk County line, where it turns northwesterly and flows through Liberty County into the Trinity River. The creek channel is narrow and shallow with a sandy bottom and follows a sinuous path through banks lined with pine and hardwood forest. The ecologically significant segment is from the confluence with the Trinity River near the Polk/Liberty County line upstream to its headwaters located east of Livingston in the central part of Polk

[6] TPWD Report, Norris and Linam, October 1999.
[7] TPWD Report, Norris and Linam, October 1999.

County. The portion that runs through Hardin County is not included in the segment as it is out of Region H.

(1) Biological Function- bottomland hardwood forest that displays significant overall habitat value.

(2) Hydrologic Function- performs valuable hydrologic functions relating to water quality and groundwater recharge of the Chicot Aquifer.

(3) Riparian Conservation Area- fringed by the Big Thicket National Preserve.

(4) High Water Quality/Exceptional Aquatic Life/High Aesthetic Value- insufficient data to evaluate criteria.

(5) Threatened or Endangered Species/Unique Communities- high diversity of freshwater mussels, many of which are rare.

8.2.8 Oyster Bayou[8]

Oyster Bayou, Chambers County: The segment within the Anahuac National Wildlife Refuge provides freshwater inflow to the coastal marsh. Wetland habitats provide important wintering and migration stopover habitat for migratory birds including Central Flyway waterfowl, shorebirds, wading birds and marsh and waterbirds. Upland habitats including prairie and woodlands are important to many neotropical/nearctic and temperate landbirds, including several sensitive/declining species. The mottled duck is an important resident waterfowl species for which the refuge provides habitat year-round for nesting, brood-rearing, molting and wintering. Coastal marshes serve as nursery areas for many important commercial and recreational fish and shellfish species including white and brown shrimp, blue crab, red drum, flounder and speckled sea trout. The ecologically significant segment is that portion of the stream within the Anahuac National Wildlife Refuge.

(1) Biological Function- Provides nursery for commercial and recreational fisheries.

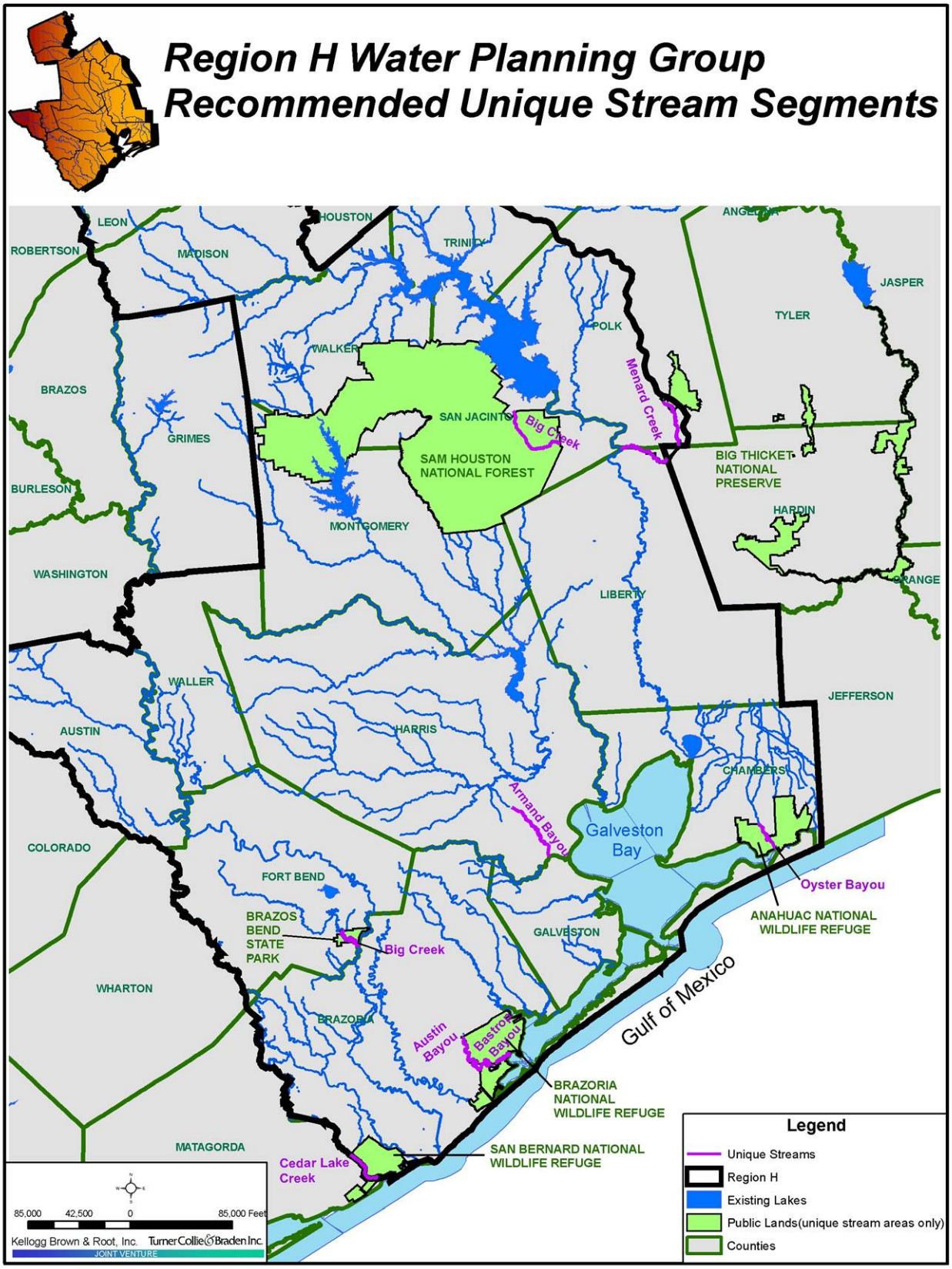
(2) Hydrologic Function- Provides sediment removal above East Bay.

(3) Riparian Conservation Area- part of the Anahuac National Wildlife Refuge.

(4) Threatened or Endangered Species/Unique Communities- Brown pelican and piping plover habitat within the Anahuac NWR.

[8] TPWD, Texas Gulf Ecological Management Sites, Anahuac NWR data page, accessed at www.tpwd.state.tx.us/texaswater/txgems/anahuac/anahuac.phtml

Figure 8-1: Recommended Unique Stream Segments



8.3 Unique Reservoir Sites

The Texas Water Code offers an opportunity to designate sites of unique value for use as surface water supply reservoirs within a planning region. The following criteria are outlined within the Texas Water Code.

> **31 TAC § 357.9 Unique Sites for Reservoir Construction**
>
> A regional water-planning group may recommend sites of unique value for construction of reservoirs by including descriptions of the sites, reasons for the unique designation and expected beneficiaries of the water supply to be developed at the site. The following criteria shall be used to determine if a site is unique for reservoir construction:
>
> 1. Site-specific reservoir development is recommended as a specific water management strategy or in an alternative long-term scenario in an adopted regional water plan; or
>
> 2. The location, hydrologic, geologic, topographic, water availability, water quality, environmental, cultural, and current development characteristics, or other pertinent factors make the site uniquely suited for:
>
> A. Reservoir development to provide water supply for the current planning period; or
>
> B. Where it might reasonably be needed to meet needs beyond the 50-year planning period.

The significance of sites of unique value for reservoir construction is defined in the Texas Water Code, 16.051:

> The legislature may designate a site of unique value for the construction of a reservoir. A state agency or political subdivision of the state may not obtain a fee title or an easement that would significantly prevent the construction of a reservoir on a site designated by the legislature under this subsection.

The Region H Water Planning Group selected two surface water reservoir projects (Allens Creek reservoir and Little River Off-Channel) for inclusion in the 2006 update to the regional water plan. Both of these projects are specific water management strategies. Water supply from each project is needed to meet water needs within the current 50-year planning period. In the 2001 Regional Water Plan, two additional reservoir projects were recommended (Bedias Creek Reservoir and Little River On-Channel Reservoir). They are now listed as viable alternatives for future planning cycles. Of the four reservoir project sites, only one (Allens Creek) has been designated by the legislature as a unique site for reservoir construction. The RHWPG recommends that the Legislature designate the remaining three projects as unique sites as well. The four sites are illustrated on Figure 8-2: Recommended Reservoir Sites.

The recommended sites are described below:

8.3.1 Allens Creek Reservoir

This site is located in Austin County, 1 mile north of the City of Wallis, on Allens Creek, a tributary to the Brazos River. This site exists within the Brazos River Basin and is in Region

H. Approximately 7,000 acres would be inundated. This project is configured as a scalping reservoir that would divert stormwater flows (periods of high water) from the Brazos River and impound these flows in the reservoir to create storage yield. During periods of median to low flows, diversions are limited by instream flow thresholds established to protect the environment and down-stream water rights. The maximum dam height is 53 feet. The conservation storage quantity is approximately 145,500 acre-feet at an elevation of 121 feet msl. The projected firm yield of this project is 99,650 acre-feet per year. The total project cost is estimated as $170,040,000. The Brazos River Authority and City of Houston will jointly develop this reservoir project for their water users within the lower Brazos and San Jacinto river basins.

8.3.2 Little River Off-Channel Reservoir

This site is located in Milam County, approximately 5 miles northeast of the City of Milano, on Beaver Creek, a tributary to the Little River. This site exists within the Brazos River Basin and is in Region G. Approximately 4,350 acres would be inundated. This project is configured as a scalping reservoir that would divert stormwater flows (periods of high water) from the Little River and impound these flows in the reservoir to create storage yield. The maximum dam height is approximately 120 feet. The conservation storage quantity is approximately 202,500 acre-feet at an elevation of 260 feet msl. The projected firm yield of this project is 32,125 acre-feet per year, when operated as part of the BRA reservoir system. The total project cost is estimated as $96,512,000. The Brazos River Authority will develop this reservoir project for their water users within the lower Brazos river basin.

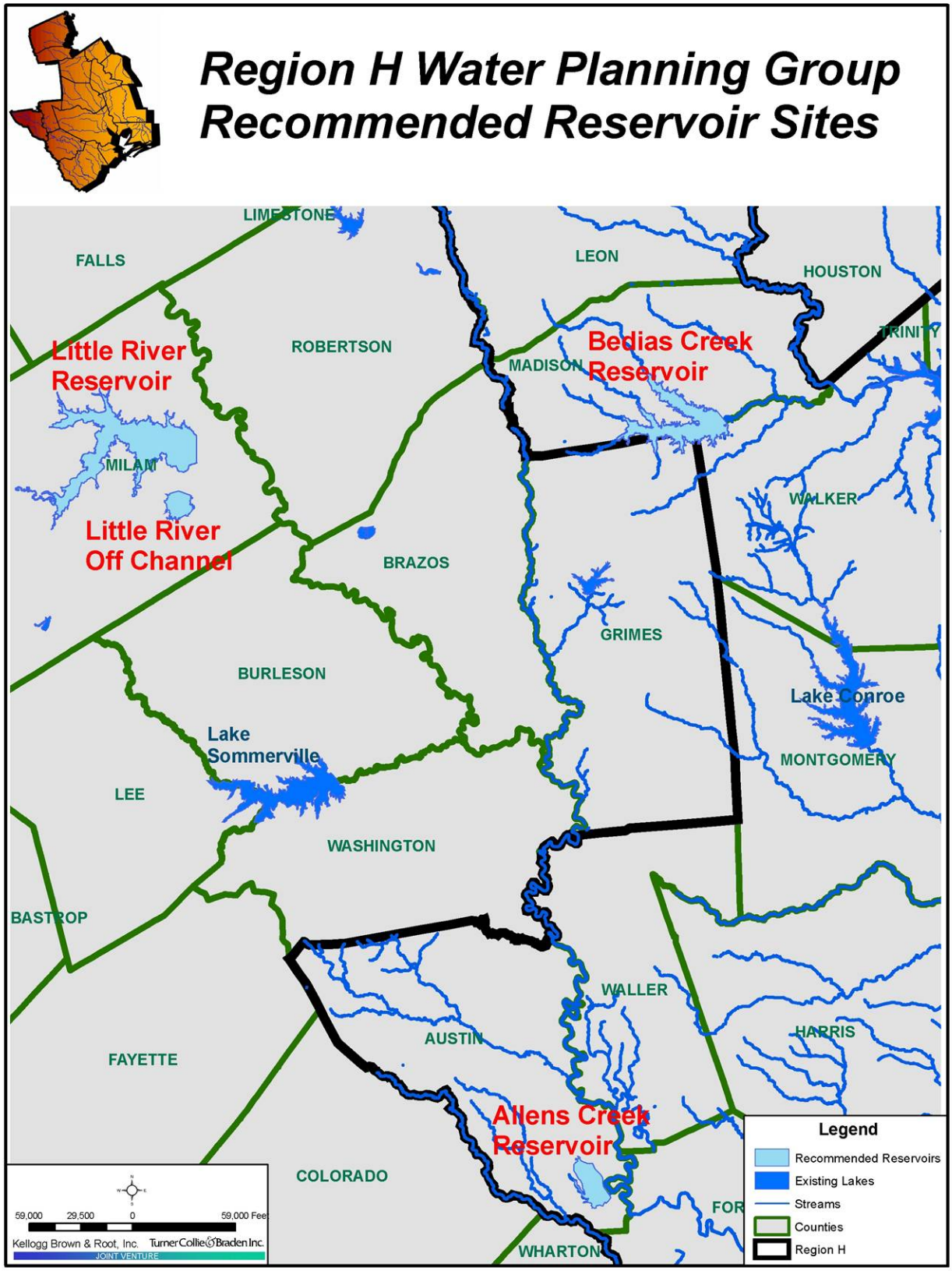
8.3.3 Bedias Reservoir

This site is at the junction of Grimes, Madison and Walker Counties, located principally within Madison County about 3.5 miles west of Highway 75. The site includes Bedias and Caney Creeks. This site exists within the Trinity River Basin and is in Regions G and H. The upstream drainage area is approximately 395 square miles. The dam is proposed with a maximum height of 45 feet and a normal pool elevation of 230 feet msl. The reservoir would have conservation storage of 181,000 acre-feet and would inundate approximately 13,000 acres. The approximate firm yield of Bedias Reservoir is 90,700 acre-feet per year. The estimated project cost is $142,700,000. This project is currently included in the TRA Trinity River Basin Master Plan. If needed, the Trinity River Authority and the San Jacinto River Authority would jointly develop this project for their water users within the lower Trinity and San Jacinto river basins, respectively.

8.3.4 Little River Reservoir

This site is located on the main stem of the Little River just upstream from its confluence with the Brazos River. It is near the City of Cameron in Milam County, and is located within the Brazos River basin within Region G. The site would have a surface area of 35,000 acres and a storage volume of about 930,000 acre-feet. The approximately 7,500 square mile upstream drainage area is uncontrolled which produces a significant yield. The fully developed site would have a firm yield of about 129,000 acre-feet per year. The approximate project cost is $383,800,000. If needed, the Brazos River Authority and the Gulf Coast Water Authority propose this project for joint development for their water customers within the Brazos and the San Jacinto-Brazos river basins.

Figure 8-2: Recommended Reservoir Sites



8.4 Regulatory, Administrative and Legislative Recommendations

Section 357.7(a)(10) of the Texas Water Development Board regional water planning guidelines requires that a regional water plan include recommendations for regulatory, administrative, and legislative changes:

> "357.7(a) Regional water plan development shall include the following…
>
> (10) regulatory, administrative, or legislative recommendations that the regional water planning group believes are needed and desirable to: facilitate the orderly development, management, and conservation of water resources and preparation for and response to drought conditions in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of the state and regional water planning area. The regional water planning group may develop information as to the potential impact once proposed changes in law are enacted."

These recommendations are addressed to each governmental agency that has the appropriate jurisdiction over each subject. It is generally assumed that regulatory recommendations are directed towards the Texas Commission on Environmental Quality (TCEQ), that administrative recommendations are directed towards the Texas Water Development Board (TWDB), and that legislative recommendations are directed towards the State of Texas Legislature (Legislature.)

8.4.1 Water Policy Survey

In July 2003, the TWDB sent a letter to the Regional Water Planning Group chairs, identifying potential policy topics to be discussed within the Regional Water Plans. An informal survey of the RHWPG members was conducted to determine which of these topics merited detailed discussion within the plan report. The items of greatest interest are listed in Table 8-3. The full survey results are shown in Appendix 8A.

Table 8-3: Key Water Policy Topics

Key Water Policy Issues:
- Interbasin Transfers
- Inter-regional cooperation and water sharing
- Watershed planning and source water protection
- Public-Private Partnerships
- Wastewater reuse and the downstream impacts of reuse
- Standardized methods and policy for determining groundwater availability
- Desalination of seawater and brackish groundwater

Key Environmental Policy Issues
- Bays and estuaries
- Instream flows
- Sustainable growth and the impacts of growth
- Watershed planning and source water protection
- Integration of water quality and supply considerations
- Criteria to measure and maintain a sound ecological environment

8.4.2 Summary of Recommendations

The Region H Water Planning Group has adopted the following regulatory, administrative, and legislative recommendations. They are discussed in detail in the following sections.

- Regulatory and Administrative Recommendations
  - Clarify the agency rules to address consistency with the regional water plans.
  - Allow more flexibility in the allocation of alternate or multiple water management strategies to meet defined water shortages.
  - Modify the notification procedures for amendments to regional water plans to limit notification requirements.
  - Clarify agency rules on quantitative environmental analysis.
  - Modify the rules for wastewater permitting so that reclamation facilities are assessed in conjunction with their source water facilities.
- Legislative Recommendations
  - Remove barriers to interbasin transfers of water within Region H.
  - Adopt the recommended stakeholder process for determining bay and basin environmental flow requirements, and include Region H and the Galveston Bay Freshwater Inflows Group (GBFIG) in the Galveston Bay stakeholder group.
  - Increase funding for the Bays and Estuaries programs of state resource agencies and for additional monitoring and research to scientifically determine freshwater inflow needs.
  - Maintain the current rule of capture basis of groundwater law within Texas in all areas not subject to defined groundwater conservation districts.
  - Support development of Groundwater Conservation Districts to protect current groundwater users, and encourage these districts to study and manage aquifer storage and recovery.
  - Establish financing mechanisms for development of new water supply projects identified within the adopted regional water plans.
  - Act on the RHWPG recommendations of unique stream segments and unique reservoir sites.
  - Continue funding of the State of Texas Groundwater Availability Modeling effort.
  - Establish funding for agricultural research into the area of efficient irrigation practices.
  - Implement the programs recommended by the Water Conservation Implementation Task Force.
  - Establish funding for research in advanced conservation technologies.
  - Resolve the issues related to water rights permitting for indirect reuse, and advocate water reuse statewide.

- Establish flood damage liability limits for water supply reservoirs.
- Continue funding of the Regional Water Planning process.

- Recommendations Specific to Infrastructure Financing

  - The State Participation Program will be the most important financing program for water supply projects sized to meet projected long-term demands. Increase the funding of this program as needed to allow development of these water supply projects.
  - The State Revolving Fund Programs will remain important to assist some systems in meeting minimum drinking water standards. As infrastructure ages and water quality standards increase, the demand for this assistance will grow. Increase the funding of this program in future decades, and expand the program to include coverage for system capacity increases to meet projected growth for communities.
  - The State Loan Program for political subdivisions and water supply corporations offers loans at a cost advantage over many commercial and many public funding options. Some entities will benefit from these loans as they convert from groundwater to surface water supplies. Increase funding of this program to allow financing of near-term infrastructure cost projections.
  - Irrigation conservation is an important part of the Region H Water Plan. Individual irrigators will require assistance in upgrading their irrigation systems to increase water efficiency. Provide a mechanism to leverage Federal grant programs by providing the local matching share. Increase funding of the Agricultural Water Conservation loan program, and consider adding a one-time grant or subsidy program to stimulate early adoption of conservation practices by individual irrigators.
  - Continue State and Federal support of the Texas Community Development Program, and increase the allocation of funds for the Small Town Environment Program.
  - The Regional Water Supply and Wastewater Facilities Planning Program assists political subdivisions with planning grants, allowing small communities to pursue cost-efficient regional solutions. Increase funding of this program in anticipation of upcoming development throughout the state, and expand the program to include the costs for preliminary engineering design and development of detailed engineering cost estimates of recommended facilities.
  - The USDA Rural Utilities Service offers Water and Waste Disposal Loans and Grants to rural areas and towns of up to 10,000 people. Certain communities within Texas are specifically targeted for these grants. Support continued and increased funding of this program at the Federal level, and fund the state Rural Water Assistance Fund.
  - Desalination is becoming an attractive management strategy to regions of the State, including Region H, but it is not yet cost-competitive with more traditional water supply projects. Provide research grants for the study of current and upcoming desalination technologies available to wholesale and retail water suppliers. Continue to fund appropriate demonstration facilities to develop a customer base, and pursue Federal funding for desalination programs.
  - Irrigators cannot generally afford the increased cost of water when new supplies are developed. By reducing demand in a cost-efficient manner, small irrigators may be able

to continue farming. Provide increased research grants to study and better develop drought-resistant crop species and efficient irrigation practices.

- The US Army Corps of Engineers (USACE) constructs civil works projects for flood control, navigation and ecosystem restoration. USACE participation in water supply projects is limited by current regulations. Support regulatory changes that will allow USACE to increase water supply storage in new reservoirs that they construct and manage, and investigate other alternatives for increased involvement of USACE in funding water supply projects.

- The costs to water users can be reduced if optimally sized regional facilities can be constructed instead of multiple small systems. Several options for forming agreements between political subdivisions exist. Region H supports the forming of regional facilities and encourages the State to remove any impediments to these entities, including restrictions to the use of public/private partnerships. Additionally, the State Participation Program should be made available to these public/private partnerships and to private nonprofit water supply corporations.

8.4.3 Regulatory and Administrative Recommendations

Consistency with the Regional Water Plans

Discussion: Water rights applications must be consistent with the Regional Water Plans in order to be approved. The TCEQ has interpreted this to mean that the requested water right must be directly linked to a recommended water management strategy, otherwise the applicant has had to petition the RWPG for a plan amendment to add their permit application. RWPGs should not be required to formally adopt or amend the regional plan to include a proposed management strategy for water supply in order for new water rights applications to be evaluated by the TCEQ. This creates a situation that can deter the study of viable alternatives by agencies outside the RWPG and may ultimately block their ability to obtain permits for new supplies that the agencies need to meet their future needs. These alternatives may be preferable to existing management strategies (such as building reservoirs) that were previously recommended by the RWPG. A water right application that is not in conflict with the regional water plan (i.e., does not compete for supply allocated in the plan) should be considered consistent with the plan by the TWDB and TCEQ. If the strategy would benefit the region, it could then be added to the plan as a formal management strategy in the next five-year update, undergoing the full analysis, consideration and Public Hearing process.

Recommendation: Amend the Agency rules to clarify the consistency requirement. Only those water rights applications in conflict with the current regional water plan should be referred to the RWPG for amendment.

Water Management Strategy Flexibility

Discussion: Section 357.7(a)(9) of the TWDB Regional Water Planning guidelines requires "specific recommendations of water management strategies to meet the needs…" The TWDB interpretation of these requirements suggests a direct relationship between a defined water shortage with one specific water management strategy. In reality, the WUG may have two or three possible suppliers that they could negotiate and choose between. Also, WUGs

may form sub-regional groups to pursue more cost effective strategies than are achievable separately. While this single-supplier option is a necessary assumption for the planning effort (so that we do not recommend more strategies than the region requires), it is unrealistic for the TWDB to hold the WUG to our recommended supplier. This by-passes the market and hinders competition. Correcting these WUG-Supplier associations in the plan (to allow TWDB funding assistance) requires a formal amendment and incurs costs related to that process. The RWPGs should not be placed in that position and the public should not bear that cost.

Additionally, WUGs and wholesale water providers may have several viable strategies to choose between. The RWPGs are limited to recommending the best or most feasible strategies, based upon the regional planning rules and assumptions. The individual WUG or WWP may opt to implement a different viable strategy, based on their own analysis and differing assumptions and criteria. Currently, reflecting this change between viable alternatives requires amending the regional water plan. If alternative strategies could be fully analyzed and recognized in the plan when it is adopted, they could be exchanged with recommended strategies without requiring a full amendment.

Policy Recommendation: The Region H Water Planning Group recommends that the TWDB and the TCEQ interpret existing legislation to give the maximum possible flexibility to water user groups and suppliers. Legislative and regulatory changes should be made to remove this requirement for specificity from the regional water planning guidelines and allow plans to present multiple sources of supply where appropriate. Alternative strategies should be designated in the plan, where appropriate, to remove the single-strategy restriction placed on water users groups.

Notification Procedures for Regional Plan Amendments

Discussion: The same notification requirements associated with adoption of a regional water plan should not be used upon amendment of a specific component of the plan. Based on the number of WUGs within the region, the RHWPG anticipates a number of plan amendments will be requested during every planning cycle. The majority of these plan amendments will only affect certain aspects of the plan and certain communities and water suppliers. The current notification requirements for the entire plan are expensive.

Policy Recommendation: The Region H Water Planning Group recommends adoption of a revised set of notification procedures for those regional water plan amendments that only affect a limited portion of the region.

Quantitative Environmental Analysis

Discussion: The Regional Water Planning Guidelines require that the evaluation of potentially feasible water management strategies include a quantitative analysis of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico (31TAC357.7.(a)(8)(A)). The TWDB has provided detailed guidance on specific study methods to be used in determining population, water demand, socioeconomic impacts and yield from current and proposed supply sources, but has not provided similar

guidance in the area of environmental impacts. This lack of specificity is resulting in different methods being used in different regions. Additionally, it places the planning groups at risk of needing to conduct additional analysis after state agencies review the Initially Prepared Plans, and add those results to the report after the public review period has closed.

Policy Recommendation: The Region H Water Planning Group recommends that the TWDB determine, in conjunction with the TCEQ and TPWD, which specific environmental studies and analysis is required for each category of management strategy (i.e., new water right, new reservoir, etc.), and that guidance be added to the Planning Guidelines, so that RWPGs can reflect these requirements in their budgets and scopes of work, and so that plans are consistent across the State.

TPDES Permitting of Wastewater Reclamation Facilities

Discussion: Existing Texas Pollutant Discharge Elimination System (TPDES) permit requirements do not encourage, and in fact discourage, wastewater reuse and reclamation.

In terms of wastewater reuse (e.g., without further treatment), a violation of an end-user's discharge permit could be caused by using effluent to replace or supplement another water source. An example would be an industry, whose discharge is close to its permitted limit for a given constituent, exceeding that limit by virtue of its use of effluent from a separate wastewater treatment plant.

In terms of wastewater reclamation (e.g., with further treatment), permitting the discharge from a wastewater reclamation facility could be difficult and unnecessarily expensive. Wastewater reclamation often entails advanced treatment of wastewater discharged from one or more treatment facilities for industrial use. If this advanced treatment facility is separate, it requires a separate TPDES permit. Under current TCEQ rules, discharges from a new facility are considered as occurring *in addition to* all currently permitted discharges, for the purpose of assessing the collective effect on the receiving stream. While this is the correct procedure for evaluating a discharge from a new waste source, it effectively double-counts the waste load from a reclamation facility (once at the original plant, and again at the additional treatment facility). Designing a reclamation facility to sufficiently mitigate this double-counting is unneeded and may be cost-prohibitive. In actuality, the waste load should be divided between the applicable facilities, depending upon the reuse and reclamation demands.

Therefore, the permitting process should be modified to address both reuse and reclamation projects that draw effluent from existing wastewater plants, so that daily loads may be accurately assessed on a combined maximum daily load and maximum daily concentration basis, and permitted accordingly.

Policy Recommendation: The Region H Water Planning Group recommends that the TCEQ modify the rules for wastewater permitting, so that the environmental impacts of reuse and reclamation facility discharges are assessed in conjunction with appurtenant reductions in discharges for their source water facilities.

8.4.4 Legislative Recommendations

Interbasin Transfers

Discussion: Under the current Texas Water Code, water rights developed as a result of an interbasin transfer become junior to other water rights granted before the interbasin transfer permit. The effect of this change is to make obtaining a permit for interbasin transfer significantly more problematic than it was under prior law and thus discourages the use of interbasin transfers for water supply. This is undesirable for several reasons:

- Current supplies greatly exceed projected demands in some basins, and the supplies already developed in those basins can only be used via interbasin transfers (Trinity basin within Region H.)
- Interbasin transfers have been used extensively in Texas and are an important part of the state's current water supply. For example, three of the five Region H Major Water Providers (City of Houston, Trinity River Authority and San Jacinto River Authority) maintain current permits for interbasin transfers collectively of over 1,000,000 acre-feet per year. Virtually all future water demands within the San Jacinto basin (Harris County in particular) of Region H must rely on interbasin transfers.
- Emerging regional water supply plans for major metropolitan areas in Texas (Dallas-Fort Worth and San Antonio) rely on interbasin transfers as a key component of their plans. It is difficult to envision developing a water supply for these areas without significant new interbasin transfers.

Policy Recommendation: The Region H Water Planning Group recommends that the legislature revise the current law on interbasin transfers and remove the unnecessary and counterproductive barriers to such transfers within the Region that now exist.

Instream Flows and Bay & Estuary Inflows

Discussion: Region H contains many water-dependant natural resources, most significantly Galveston Bay, which provide ecological habitat for native and migratory species. Under current water law, waters of the state belong to the environment until appropriated for another beneficial use. As basins become fully allocated, a method of establishing a minimum environmental flow for each stream or estuary must be established, both to protect the environment and to facilitate water planning.

The Study Commission on Water for Environmental Flows delivered an interim report to the 79th Legislature. In that report, the study commission recommended, among other things, that the study commission be reauthorized, and that the commission appoint a Bay/Basin Area Stakeholder group for each bay/basin ecological area of the state. Such group would then take prescribed actions leading to the establishment of environmental flow "set-asides" for its bay/basin ecological area. These values would be reviewed on a ten-year basis. The commission recommended that Galveston Bay be included on the first round bay/basins list.

Recommendation: The Region H Water Planning Group endorses the stakeholder process and requests that Region H and the Galveston Bay Freshwater Inflows Group (GBFIG) be represented on the Galveston Bay BBAS.

Texas Bays and Estuaries Program Funding

Discussion: The Galveston Bay Estuary Program is established under the EPA's National Estuaries Program. Support is provided by the TCEQ, EPA and others for projects that implement action items found in "The Galveston Bay Plan." Actions outlined in The Galveston Bay Plan include habitat protection, species population protection, public health protection, freshwater inflow and bay circulation, spills/dumping, shoreline management, water and sediment quality, non-point sources of pollution, point sources of pollution, research, public participation and education, and the Galveston Bay regional monitoring program. Funding for this Program is limited.

Galveston Bay is a unique resource that is a vital part of the Region H economy. Current levels of funding for programs within the State of Texas related to bays and estuaries are insufficient to provide the needed monitoring, analysis and development of management strategies for these significant resources.

In-stream flow requirements and freshwater inflow requirements for estuaries are now required considerations in new water rights and water supply projects. These target flows must therefore be appropriate, since they will affect operational changes for existing reservoirs and the permitting and cost of any future reservoirs. Although Region H is focused upon the Galveston Bay, the same body of scientific knowledge must be developed for Sabine Lake, Matagorda Bay and the other bays and estuaries in the State of Texas.

Policy Recommendation: Increase funding of the programs which impact research related to the bays and estuaries in order to (1) increase the body of scientific knowledge about Galveston Bay in general, and (2) establish a body of research for the other estuaries of the state.

Rule of Capture

Discussion: Groundwater is a vital resource within Region H. This is especially true within the rural counties of the region that are predominantly dependent on groundwater. Current groundwater law based on the Rule-of-Capture has facilitated orderly development of groundwater systems throughout the State of Texas and, barring the intrusion of private interests, could continue to serve the water usage interests throughout the state. It appears that the Rule-of-Capture could continue per the status quo to serve the groundwater interests within the region.

Policy Recommendation: The Region H Water Planning Group supports continued usage of the Rule-of-Capture as the basis of groundwater law throughout the State of Texas except as modified through creation of certified groundwater conservation districts.

Groundwater Conservation Districts

Discussion: Region H communities, particularly those within the rural areas of the region, are dependent on groundwater supplies. Groundwater is a very valuable resource to this region. Region H also has several counties, including Brazoria, Waller and Montgomery,

where groundwater supplies will, in theory, reach their maximum sustainable yield due solely to projected in-county water usage rates. A groundwater conservation district (GCD) is a potential vehicle for these counties to retain long-term groundwater supplies within their respective counties, and to manage and protect groundwater supplies from over-development within each respective county. The potential of losing these supplies to outside interests before the county of origin can maximize the use of these supplies would create a burden on local water users.

Also, aquifer storage and recovery (ASR) offers the potential of storing treated surface water during off-peak seasons, and recovering it during peak use periods, saving the costs and evaporative loss potential of surface reservoirs. The viability of this strategy is specific to the aquifer and strata available at the project location, and should be managed by the local subsidence or groundwater conservation district, if applicable, to protect both the ASR sponsor and the neighboring well owners.

Policy Recommendation: The Region H Water Planning Group supports creation of GCDs, as necessary, by local sub-area water interests. The RHWPG supports development of truly regional GCDs as opposed to single county districts to recognize the regional expansiveness of underground aquifers and to provide the greatest degree of regional water supply protection. It further encourages these GCDs to study and manage ASR, in those aquifers where it is feasible.

Water Supply Project Financing Mechanism

Discussion: The Region H Regional Water Plan includes development of several surface water reservoirs and other supply projects. The capital cost to develop these projects is significantly higher than the historic cost of water supply projects. The projected costs are such as to dissuade local communities from making a financial commitment to support future projects. These financing issues will delay the implementation of needed projects.

Policy Recommendation: The Region H Water Planning Group supports establishment of financing methods by the State of Texas to capitalize a fund to support development of water supply projects recommended within adopted regional water management plans. Program specific recommendations are listed in Section 8.4.5, below.

Act on Unique Stream Segments and Reservoir Sites

Discussion: In the first round of regional water planning, the significance of designating an ecologically unique stream segment or unique site for reservoir construction was not defined. The Water Code has since been amended to define the meaning of these designations when granted by the Legislature. Region H has recommended eight stream segments for designation as ecologically unique, and four sites for reservoir construction. Only one of these sites (Allens Creek Reservoir) has been so designated by the Legislature).

Policy Recommendation: The Region H Water Planning Group requests that the Legislature act on its remaining recommendations of ecologically unique stream segments and unique sites for reservoir construction.

Groundwater Availability Modeling Funding

Discussion: Many areas of Region H are totally dependent on groundwater to support the long-term viability of these areas. The current Groundwater Availability Modeling effort is supported since it is the most comprehensive groundwater assessment and analysis effort of the previous 20 years. The current GAM effort must be maintained to ensure the models are kept current and remain useful as a planning tool.

Policy Recommendation: The Region H Water Planning Group supports continued funding for the GAM effort, and recommends continued analysis of all groundwater resources within the state.

Agricultural and Irrigation Conservation Funding

Discussion: The Region H water management plan includes a number of irrigation conservation based water management strategies. It is apparent that adoption of irrigation conservation practices may benefit the irrigation and agricultural industry in addition to local communities that may take advantage of water supply savings resulting from irrigation conservation. Additionally, the RHWPG supports further research and development of water-efficient and drought-resistant crop and species.

Policy Recommendation: The Region H Water Planning Group supports funding of research and development studies associated with the efficient usage of irrigation technologies and practices.

Water Conservation

Discussion: The RHWPG strongly supports water conservation at all levels, and has incorporated it in the regional water plan as a management strategy. The Water Conservation Implementation Task Force report to the 79th Legislature makes practical and programmatic recommendations, including a statewide public awareness program, regional conservation coordinators and the establishment of per-capita water use targets and conservation goals. The RHWPG agrees with the Task Force that a one-size-fits-all conservation program will not work in a state as large as Texas, and applauds their work in identifying numerous best management practices.

Policy Recommendation: The Region H Water Planning Group supports water conservation and recommends that the legislature implement the programs outlined in the Water Conservation Implementation Task Force report.

Water Conservation Research Funding

Discussion: The Water Conservation Implementation Task Force identified numerous best management practices in TWDB Report 362 – Water Conservation Best Management Practices Guide. The Best Management Practices outlined that report were developed using information compiled from past research and studies along with information provided by the task force members. Additional water-saving technologies may still be developed in the future.

Policy Recommendation: The Region H Water Planning Group recommends that the State fund research into advanced conservation technologies.

Wastewater Reuse

Discussion: The TCEQ water rights permitting process for wastewater reuse need to be clarified. Conflicts exist between Texas Water Code Sections 11.042 and 11.046 regarding the permitting of indirect reuse water. Section 11.042(c) states that return flows, once introduced to the stream, are property of the State of Texas and are therefore subject to appropriation by others. However, Section 11.046(b) and (c) allow the owner of return flows to obtain a bed-and-banks permit to transport this water to a place of reuse. This leads to potential conflicts between downstream appropriators and those who wish to indirectly reuse effluent.

Furthermore, the TCEQ has issued some water rights permits based on the existence of return flows in the river, and in the adjudication process some claims were established based on return flows. Additionally, some bed and banks permits were issued with priority dates, while others were issued without priority dates. Because of these issues and the conflicts discussed above, it is difficult to analyze indirect reuse as a water management strategy. Due to these significant unknowns and outstanding questions, the benefits and yields from reuse projects cannot be accurately estimated under the current regulatory environment. Specific regulatory issues that need to be resolved or clarified are outlined below:

- A policy for establishing a priority date, if any, for an indirect reuse authorization (i.e., bed-and-banks authorization) should be developed.
- Conflicts between Texas Water Codes 11.042 and 11.046 relating to the ownership of return flows (water right holders, groundwater users, and the State) need to be resolved.
- A policy for establishing the method and technical approach for evaluating indirect reuse permits (i.e., “no injury” analysis, WAM Run 3, WAM Run 8, etc.) needs to be developed.
- Clarification regarding the ownership of return flows and the right to permit return flows for indirect reuse needs to be provided. The issue of third-party permitting of return flows needs additional clarification.
- Additional clarification regarding the notification requirements for reuse permits, addressing both new discharges and historically discharged effluent, should be developed to ensure the protection of existing water rights.

These above issues directly impact water management strategies recommended in the Region H Water Plan, and therefore regulatory clarification is required.

Policy Recommendation: The RHWPG recommends that TCEQ resolve the issues related to the permitting of indirect reuse water rights. In addition, the RHWPG supports wastewater reuse as a management strategy, and recommended it be advocated statewide through targeted State funding or other incentives to promote reuse projects.

Flood Liability of Water Supply Reservoirs

Discussion: Flood control reservoirs are generally drawn down at the beginning of the annual wet season so that when large rain events occur, the runoff may be captured and later released more slowly into the receiving stream. These reservoirs therefore reduce downstream flood levels and prevent inundation in low areas. In contrast, water supply reservoirs are operated to capture and retain as much streamflow as allowable under their permits, in order to have supply available during periods of high demand. This practice results in less available storage volume to capture runoff during major storms. When a major storm event occurs upstream or above a water supply reservoir, the reservoir operator must sometimes release flood flows during and after the event to prevent flooding upstream of the reservoir or to prevent damage to the dam and other facilities associated with the reservoir. This flood flow can contribute to downstream flooding, but with most reservoirs, actually reduces the amount of flooding which would have occurred had the reservoir not been constructed.

In recent years, plaintiffs with property in the downstream floodplains have brought multiple lawsuits against major water supply reservoir operators. Some recent court decisions have held the operators liable for damages to the downstream properties. If this trend is allowed to continue, this will force insurance rates for these entities to rise and operational changes to occur that may result in less available water storage for periods of need. The net affect to water users will be an increase in the cost of surface water throughout the state.

Policy Recommendation: Consider State legislation clarifying the liability exposure of reservoir operators for passing storm flows through water supply reservoirs.

Ongoing RWPG Activities

Discussion: The Regional Water Planning process began under the TWDB planning grant rules, with a requirement for a local funding match. In the second round of planning, the process was funded solely by the TWDB, allowing the RWPGs to function independently. As agency budgets are reconsidered and possibly reduced, the need to find local planning sponsors may be reconsidered. The RHWPG is opposed to this option, because it may give the appearance of the funding agencies dictating the outcomes.

Policy Recommendation: The RHWPG recommends that the TWDB continue to fund the Regional Water Planning Process.

8.4.5 Recommendations Specific to Infrastructure Financing

Program / Policy Item: State Participation Program for regional water and wastewater projects

Discussion: This program enables the Water Development Board to assume a temporary ownership interest in a regional project when the local sponsors are unable to assume debt for an optimally sized facility. Payments on the funds provided by the State are deferred until a customer base grows into the capacity it funded. The deferred interest payments do not accrue additional interest. By funding up to 50% of a project, the program helps the local sponsors optimize facility sizes and avoid later expansions and replacements.

This program will be extremely important for the development of the recommended water management strategies, as well as for water treatment and distribution systems. Large projects, particularly reservoirs, must be developed in anticipation of future demands due to the long periods of time required for planning, permitting, property acquisition and construction. For example, Bedias Reservoir, which will require a transmission system as well as the reservoir itself, is estimated to cost $194.3 million. The current customer base cannot support this high cost. The Bureau of Reclamation no longer funds the development of new water supply reservoirs and this project would not qualify for other federal funding. Therefore, the State Participation program is one of the few programs available to assist local sponsors with this water management strategy. Other reservoir projects within Region H could also experience similar financing issues.

The State Participation Program will also be important during the expansion of surface water service into areas affected by subsidence. As areas develop and implement Groundwater Reduction Plans, it is expected that communities will develop plans for regional treatment and distribution systems to reduce costs. State participation in these facilities will allow them to be optimally sized at their inception. The State Participation Program offers the important advantage of reducing the unit costs for water service for both existing and future water users of the optimally sized facility.

Policy Recommendation: Increase funding of the State Participation Program as needed to allow development of these water supply projects.

Program / Policy Item: State Revolving Fund Programs (Drinking Water State Revolving Fund and Clean Water State Revolving Fund)

Discussion: These programs provide loans at subsidized interest rates for the construction of water treatment and distribution systems and for source water protection (DWSRF) and for wastewater collection and treatment systems (CWSRF). As the loans are paid off, the TWDB uses the funds to make new loans (thus the name Revolving Fund). State funds for the program receive a federal match through the Environmental Protection Agency. These loans are intended for projects to bring existing systems into compliance with rules and regulations, and are available to political subdivisions, water supply corporations and privately-owned water systems. Applications are collected at the beginning of each year, given a priority ranking, and funded to the extent possible. Projects not funded in a given year may carry forward into the next year's ranking.

These programs are important in that they assist sub-standard water systems in attaining the minimum water quality mandated by Federal and State regulations, but they are not intended to fund system expansions due to projected growth. However, these programs may apply to individual systems in the Region experiencing water quality declines, or to those systems affected by the changed standard for Arsenic. The SRF Fund may also provide assistance to water providers with aging treatment systems and transmission lines.

Policy Recommendation: Increase the funding of this program in future decades, and expand the program to include coverage for system capacity increases to meet projected growth for communities.

Program / Policy Item: State Loan Program

Discussion: The State Loan Program provides loans to Political Subdivisions and Water Supply Corporations for water, wastewater, flood control and municipal solid waste projects. Payments are not deferred in this program as they are under the State Participation Program, and the interest rates are not subsidized as they are in the Revolving Fund Programs. These loans are available for both local projects and for the local sponsors of regional projects. Acquisition and construction of water treatment and distribution systems are eligible for funding. Loans are made on a first come, first served basis.

This program will be heavily utilized in groundwater-served areas introducing surface water to meet current and projected demands. The ready availability of groundwater across the region has allowed development to occur outside existing surface water service areas. As the limits of available groundwater are reached (sustainable yields and/or regulatory limits), surface water treatment and transmission systems must be constructed to meet future demands. The costs are significant in that they are required in a short time span, instead of initiated and expanded over time as they are in areas originally served by surface water. Where local rate payers cannot afford to directly pay for transition costs, State loans offer a significant cost advantage over most commercial and many public funding options, using the State's high bond rating rather than the rating of the local sponsor.

Policy Recommendation: Increase funding of this program to meet near-term infrastructure cost projections.

Program / Policy Item: Agricultural Water Conservation Loan Program

Discussion: This program provides loans to soil and water conservation districts, underground water conservation districts and districts authorized to supply water for irrigation. These districts may further lend the funds to private individuals for equipment and materials, labor, preparation and installation costs to improve water-use efficiency related to irrigation of their private lands. There is also a grant program for equipment purchases by eligible districts for the measurement and evaluation of irrigation systems and agricultural water conservation practices, and for efficient irrigation and conservation demonstration projects, among others. However, these grants are not available to individual irrigators. Similar Federal loan and grant programs are available, but require a 25% to 50% local match.

In the Region H Water Plan, irrigation conservation is a recommended strategy in six counties (Brazoria, Chambers, Fort Bend, Galveston, Liberty and Waller), and is extremely important in Waller County where the reductions in irrigation are projected to allow reallocation of supply to meet municipal demands. As it is unlikely that municipalities will seek out and fund irrigation conservation projects, the task of encouraging conservation will fall to the wholesale water providers and those government entities with jurisdiction in those counties. Even with Agricultural Water Conservation Loan Program assistance, irrigators will be slow to invest in water-conserving equipment until water rates increase, making it economically advantageous to do so. The difficulty increases in areas where groundwater is the primary supply source for irrigation.

Eligible districts will need to act as conservation brokers, identifying those irrigators with the potential to reduce water demand through equipment improvements, and matching them with

available loans. By reducing usage in this manner, water suppliers will be able to provide the saved portion of their supply to new customers. To assist with the immediate adoption of these improved conservation practices, a one-time grant or subsidy program for water-efficient equipment purchases may help by reducing the loans amounts required by each irrigator. If the requirements of an existing Federal loan or grant program could be met, the State could provide all or part of the local matching share. Since the methods used by irrigators vary across the state, such a program would need to be flexible, with local oversight provided by those districts currently eligible for the Agricultural Water Conservation Loan Program. Consistency with the applicable Regional Water Plan may be included as a prerequisite for this program, as it is for other State grants and loans.

Policy Recommendation: Provide a mechanism to leverage Federal grant programs by providing the local matching share. Increase funding of this loan program and consider adding a one-time grant or subsidy component to stimulate early adoption of conservation practices by individual irrigators.

Program / Policy Item: Texas Community Development Program

Discussion: The federal Community Development Block Grant program provides grants and loans to low-income communities for certain projects, including water and wastewater infrastructure. It is administered in Texas under the Office of Rural Community Affairs as the Texas Community Development Program. The Small Town Environment Program (STEP) under the TCDP provides water and sewer system grants to cities and counties not eligible for funding under the Colonias or Economically Disadvantaged Areas Programs (EDAP). Within Region H, there are no Colonias or EDAP-eligible communities, but STEP grants may be obtained.

Policy Recommendation: Continue State and Federal support of the Texas Community Development Program, and increase the allocation of funds for the Small Town Environment Program.

Program / Policy Item: Regional Water Supply and Wastewater Facilities Planning Program

Discussion: This program provides planning grants to Political Subdivisions for studies and analyses to determine feasible alternatives for regional water supply and wastewater facility needs. The planning must include more than one service area or political subdivision to be considered regional. Grants are generally limited to 50% of the total cost, and cannot be applied to the preparation of state and federal permits, administrative or legal proceedings of regulatory agencies, or the preparation of engineering plans and specifications.

This grant program can assist in planning for local areas, particularly the unincorporated areas of each county. Local sponsors investigating the best means to serve their populations may join with neighboring communities and water providers and request a planning grant, thus reducing their individual planning costs. Determination of the optimal institutional arrangement between political subdivisions is one of the eligible study areas under this program. Should a regional facility prove to be the best solution for the group, they may elect to pursue additional support from the State Loan and Participation programs.

One limitation of the program is that it cannot be applied to the detailed facility planning or preliminary engineering design of the proposed facility. These early engineering phase costs can represent as much as 30% of the cost of the facility, and generally must be completed before accurate financial requirements can be defined. Inclusion of these costs in either the planning grant or pre-project loan programs would better help these small communities develop the projects they need.

Policy Recommendation: Increase funding of this program in anticipation of upcoming development throughout the state, and expand the program to include the preliminary engineering design costs for recommended facilities.

Program / Policy Item: Water and Waste Disposal Loans and Grants from the USDA Rural Utilities Service

Discussion: This Federal program provides loans and grants in rural areas and communities of up to 10,000 people for water, wastewater, storm water and municipal solid waste projects. The program is intended for communities that cannot obtain commercial loans at reasonable rates. Loans are made at or below market rates, depending upon the eligibility of the recipient. Grants can cover up to 75% of project costs when required to reduce user costs to a reasonable level. A separate program of Emergency Community Water Assistance Grants (up to $500,000 per project) is also available to communities experiencing rapid declines in water quality or quantity.

This program is similar to the state loan and revolving fund programs. It offers another option to small communities and rural areas unable to finance required infrastructure without assistance. However, this is a nationwide program, and the competition for available funds is correspondingly greater. Colonias and border areas are specifically identified as target areas for the grant portion of this program, and it is therefore in the State's interest to support its continued funding.

The TWDB was recently authorized by the 77th Texas legislature to establish a similar program at the state level. The Rural Water Assistance Fund will provide low-interest loans to municipalities, water districts and non-profit water supply corporations. The program is still under development and has not yet been funded.

Policy Recommendation: Support continued and increased funding of this program at the Federal level, and fund the State Rural Water Assistance Fund.

Program / Policy Item: Desalination Research and Demonstration Projects

Discussion: House Bill 1370 of the 78th Texas legislature directed the Texas Water Development Board to "undertake or participate in research, feasibility and facility planning studies, investigations and surveys as it considers necessary to further the development of cost-effective water supplies from seawater desalination in the state." The TWDB has concluded desalination site assessments, and is preparing to assist in the construction of three demonstration facilities along the Texas Gulf Coast. The Region H Water Planning Group supports this demonstration project.

Policy Recommendation: Provide research grants for the study of current and upcoming desalination technologies available to wholesale and retail water suppliers. Continue to fund appropriate demonstration facilities to develop a customer base, and pursue Federal funding for desalination programs.

Program / Policy Item: Water Research Program - Agriculture

Discussion: The Texas Water Development Board offers research grants to individuals or political subdivisions for water research on topics published in the Board's Request for Proposals. Eligible topics include product and process development.

In the Region H Water Plan, one recommendation to the legislature is to establish funding for agricultural research in the areas of efficient irrigation practices and the development of water-efficient and drought-resistant crop and species. Irrigators cannot generally afford the increased cost of water when new supplies are developed in today's market. By reducing demand in a cost-efficient manner, small irrigators may be able to continue farming. This is another potential topic for the Water Research Program.

Policy Recommendation: Provide increased research grants to study and better develop drought-resistant crop species and efficient irrigation practices.

Program / Policy Item: Federal Civil Works projects

Discussion: The U.S. Army Corps of Engineers (USACE) builds and operates dams and reservoirs for flood control purposes under its Civil Works program. Congress authorizes funding on a project by project basis. Under current regulations, storage in these reservoirs may be used for present and future municipal and industrial water supply, but that portion of the project must be funded by a non-Federal agency. Also, only 30% of the M&I water storage may be allocated to future needs. The balance must supply existing water users, as the repayment schedule for non-Federal costs is capped at 30 years. USACE is also authorized to fund projects for navigation, water quality improvement and ecosystem restoration.

As a result of the first round of Regional Water Planning, the Texas Congressional Delegation requested a study on the potential for federal assistance with water supply in Texas. The Fort Worth District recently published the Texas Water Allocation Assessment Report, which identifies those projects that USACE might participate in. Within Region H, only Bedias Reservoir might receive USACE funding if the scope of the project were modified to include flood control. Also discussed were potential modifications to existing reservoirs to increase water supply yields (these modifications are generally limited to a 15% increase in storage). A saltwater barrier to improve water quality in the Brazos River was also identified as a potential project. USACE also has the ability to provide planning assistance to states for regional water supply studies, particularly studies crossing state and international boundaries.

Limitations for USACE assistance with water supply projects are (1) current policy preventing the USACE from participating in single–purpose water supply projects, (2) USACE inability to share the cost of water supply projects, and (3) the time required to move

appropriations actions through the federal government.. The Texas Congressional Delegation could pursue changes to the governing regulations to allow participation in water supply projects, or to increase the percentage of water supply storage for future use allowed in USACE projects. However, USACE civil works projects are authorized individually by Congress. If the project sponsor desires USACE assistance, an exception permitting that assistance might be authorized in the same appropriation bill. The latter option requires the sponsor to have a project champion in Congress.

Policy Recommendation: Support regulatory changes that will allow USACE to increase water supply storage in new reservoirs which they construct and manage, and investigate other alternatives for increased involvement by USACE in funding water supply projects.

Program / Policy Item: Regionalization

Discussion: As communities assess the growing costs of water infrastructure, economies of scale can be realized by combining the needs of water user groups into larger, more efficient water supply, treatment and distribution facilities. Regional facilities offer interconnections between existing systems, which can increase overall reliability. The individual system connections to these systems can be phased over time to meet regional demands with less impact on individual systems than each individually trying to expand. In areas where groundwater limits are being reached, regional groups can identify areas where surface water supply is most needed, and allow other areas to remain on groundwater systems. Sharing costs across a wide customer base keeps rates comparable between service areas.

A range of cooperative options exists, including formation of regional authorities, inter-local agreements, public-private partnerships, local government corporations and public contracting with a private regional supplier. The optimal arrangement between political subdivisions depends upon the specific project and the goals of the parties. Partnerships with private investors through public-private partnerships and direct contracting with privately-owned facilities offer an advantage of using private financing to meet part of the initial planning and construction costs. The regulations governing these partnerships must protect the public represented by the partnership, but if too restrictive, may prevent the partnership from realizing potential cost savings though the use of private-sector procurement and construction practices.

Consideration should be given to reducing procurement restrictions for Local Government Corporations to encourage the pooling of resources for funding regional projects. Also, existing assistance programs should remain available when political subdivisions enter into public/public or public/private partnerships.

Policy Recommendation: Region H supports the forming of regional partnerships and encourages the State to allow them the greatest possible latitude for financing in their governing regulations. Additionally, the State Participation Program should be made available to these public/private partnerships and to private nonprofit water supply corporations.

Appendix 8A

Policy Topic Survey

REGION H REGIONAL WATER PLANNING GROUP

Policy Issues Questionnaire - March 2004

Ranks:	0 no opinion	0 not at all	1 somewhat	2 important	3 extremely	Avg Rank
A. Agricultural and Rural Water						**1.6**
1. Improved water use information for irrigation and livestock watering categories	2		5	3		1.1
2. Impacts on water supply and quality resulting from conversion of agricultural lands to urban lands			4	5	1	1.7
3. Protecting agricultural and rural water supplies, considering economic constraints and competing uses			3	6	1	1.8
4. Quantification of impacts to rural Texans of water transfers (e.g., effects on income, employment, population)			2	7	1	1.9
5. Conservation of agricultural water for additional agricultural use, urban uses or for environmental purposes (i.e., how to treat this "new" water)			4	3	3	1.9
6. Incentives for individual projects, including stock tanks	1	1	6	2		1.0
7. Effects of Safe Drinking Water Act on Small Water supply systems			5	4	1	1.6
8. Other topics in this category:						
B. Conservation						**1.8**
1. Incentives (e.g., landscaping and plumbing rebates)			6	2	2	1.6
2. Retail customer water pricing	1		1	5	3	2.0
3. Per capita water use analysis considering commercial and institutional use, income, hosting stock characteristics, and geographical location	1		4	3	2	1.6
4. Relationship between drought contingency planning and regional water planning			2	5	3	2.1
5. Quantifying conserved water			3	5	2	1.9
6. Other topics in this category:						
Impact of ASR				1		
C. Data						**1.5**
1. Data for rural areas		1	5	4		1.3
2. Access to data, including security constraints		1	4	4	1	1.5
3. Compatibility of data from different sources			3	6	1	1.8
4. Linkages of databases			6	3	1	1.5
5. Trends in data collection and availability	2		3	5		1.3
6. Consistent analytical techniques	2		2	4	2	1.6
7. Other topics in this category: GIS Mapping to define boundaries/areas (to prevent double or overlooked data)						
Monthly or daily peaks (more real than annual)						

D. Environmental						**1.9**
1. Bays and estuaries			1	6	3	2.2
2. Instream flows			1	6	3	2.2
3. Regional or statewide environmental mitigation system			4	3	3	1.9
4. Sustainable growth, including impacts of growth			1	5	4	2.3
5. Watershed planning/source water protection			2	2	6	2.4
6. Integrating water quality and water supply considerations			1	8	1	2.0
7. Environmental criteria to measure and maintain a sound ecological environment			1	7	2	2.1
8. Texas Water Trust	2		6	2		1.0
9. Unique stream segments			7		3	1.6
10. Invasive species		1	2	5	2	1.8
11. Environmental water permits	2		5	1	2	1.3
12. Wildlife resources, including threatened and endangered species	1		5	1	3	1.6
13. Other topics in this category:						

E. Groundwater						**1.8**
1. Sustainability and groundwater management			1	5	4	2.3
2. Linking groundwater and surface water models (see also surface water)			3	5	2	1.9
3. Conjunctive use of groundwater and surface water (see also surface water)			1	5	4	2.3
4. Rule of capture	2		2	3	3	1.7
5. Coordination between Groundwater Conservation Districts and Regional Water Planning Groups			1	4	5	2.4
6. Standardized methods/policy for determining groundwater availability			2	6	2	2.0
7. Improving groundwater availability data			2	7	1	1.9
8. Groundwater export and potential equity issues (e.g., use of export fees)			2	6	2	2.0
9. Adequate financial resources for districts	1		4	4	1	1.5
10. Impacts of Texas Water Code of 36.121, “Limitation on Rulemaking Power of Districts Over Wells in Certain Counties”	4		3	2	1	1.0
11. Abandoned oil and gas wells, including waters supply and quality impacts			5	5		1.5
12. Clarifying state roles and district roles			4	5	1	1.7
13. Water marketing (e.g. water rights leases, sales, transfers)			2	7	1	1.9
14. Variability of “historical water use” definition			4	6		1.6
15. Other topics in this category:						
Note for item 4: needs revising						

F. Innovative Strategies						**2.1**
1. Desalination of seawater and brackish water			2	3	5	2.3
2. Reuse (including basin-specific assessment of reuse potential and impacts)			1	4	5	2.4
3. Planning beyond the current fifty-year time horizon	1		5	2	2	1.5
4. Other topics in this category:						

G. Providing and Financing Water and Wastewater Services						**1.8**
1. Incentives for planning implementation	1	1	2	6		1.4
2. Regionalized water supply	1		1	6	2	1.9
3. Ranking proposals as a component of financial assistance	1	1	2	4	2	1.6
4. Potential funding sources for water supply	1	1	1	3	4	1.9
5. State participation	1		1	2	6	2.3
6. Public-private partnerships	1		3	3	3	1.8
7. Other topics in this category:						

H. Surface Water						**2.0**
1. Assessment of the current water resource regulatory system to meet water management needs of the 21st century		1	2	6	1	1.7
2. Cumulative effects on water availability of exempt water storage facilities (e.g. stock ponds)	1	1	5	3		1.1
3. Linking groundwater and surface water models (see also groundwater)			4	4	2	1.8
4. Conjunctive use of groundwater and surface water (see also groundwater)			1	6	3	2.2
5. Interbasin Transfer (IBTs)				3	7	2.7
6. Subordination agreements (including basin-specific assessment of subordination agreements)	1		1	7	1	1.8
7. System operation of water facilities (e.g. coordination of multiple reservoirs)			1	5	4	2.3
8. Reservoir storage reallocation (e.g. from flood storage to water supply storage)			2	5	3	2.1
9. Water marketing (e.g. water right leases, sales, transfers)			2	7	1	1.9
10. Competing demands on reservoir operation (e.g. B&E flows, recreation, municipal supply, aesthetics, etc.)			2	5	3	2.1
11. Watermaster program (e.g. expansion, funding, enforcement)			3	5	2	1.9
12. Other topics in this category:						

I. Other Issues						**1.9**
1. Education			3	4	3	2.0
2. Inter-regional cooperation / Inter-regional water sharing				5	5	2.5
3. Public involvement			3	5	2	1.9
4. Security of supply from potential disruptions		1	1	5	3	2.0
5. Heritage / tourism / recreation / cultural resources		1	4	4	1	1.5
6. Consistency between regional water planning and rules for drinking water systems regarding minimum requirements for water supply			3	7		1.7
7. Other topics in this category:						

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9. Water Infrastructure Financing Recommendations

9.1 Introduction

In Senate Bill 2 of the 77th Texas Legislature, the preparation of an Infrastructure Financing Report (IFR) was added to the regional planning process. The purpose of the IFR is to identify the funding needed to implement the water management strategies recommended in the 2006 Regional Water Plan. The primary objectives of this chapter/report are:

- Determine the number of Political Subdivisions with identified needs that will be unable to finance their water infrastructure needs;
- Determine the amount of infrastructure costs in the 2006 Regional Water Plan that cannot be financed by the local Political Subdivisions;
- Determine funding options, such as State funding, that are proposed by the Political Subdivisions to finance water infrastructure costs that cannot be financed locally; and
- Determine additional roles the Regional Water Planning Group proposes for the State in financing the recommended water supply projects.

A survey of Water User Groups (WUGs) with identified infrastructure needs was conducted, and the results of those surveys are summarized in Section 9.3 of this chapter.

The Region H Water Planning Group reviewed the current role of the State in financing water supply projects and made recommendations for program increases and new initiatives in Chapter 8 of this plan.

9.2 Capital Costs for the 2006 Region H Water Plan

The estimated cost of the 2006 Region H Water Plan is $5.5 billion over the 50-year planning period. This cost includes the development of new water sources, estimates for distribution and treatment facilities, and the capital improvements required to achieve agricultural conservation targets. Water management strategies (WMS), such as new water source projects and major conveyance systems, are estimated at $1.14 billion (see Table 9-1). Local treatment and transmission systems for Water User Groups (WUG), including additional well and storage capacity, are estimated at $2.1 billion (see Table 9-2). Additionally, costs are included for internal distribution system expansions for the North Harris County Regional Water Authority ($800 million), the West Harris County Regional Water Authority ($793 million) and the City of Houston ($623 million). These three entities supply treated water to member/customer WUGs, and are adding surface water infrastructure to meet their respective Groundwater Reduction Plans (GRPs), as required by local subsidence districts.

As can be seen in Table 9-1, several recommended water management strategies (WMS) reallocate existing water supplies and require no capital infrastructure beyond WUG system expansions. These costs are reflected in the WUG cost estimates in Appendix 4C, and summarized in Table 9-2. Also, several strategies require the Luce Bayou Transfer water management strategy to move existing supplies from the Trinity River Basin to Harris and Montgomery Counties.

Table 9-1: Recommended Water Supply and Transmission Strategies

Water Management Strategy	Starting Decade	Yield (ac-ft/yr)	Capital Cost (2002 $)
Municipal Conservation	2000	100,987	$ 16,154,000
Industrial Conservation	2000	TBD	TBD
Irrigation Conservation	2010	77,900	$ 573,000
Expanded Use of Groundwater	2010	91,497	at WUG level
Expand/Increase Current Contracts	2010	68,300	at WUG level
New Contracts from Existing Supply	2010	215,400	see Luce Bayou
Non-Municipal Contractual Transfers	2010	21,000	at WUG level
Redesignation of Existing Water Rights	2010	N/A	N/A
BRA System Operations Permit	2010	120,000	$ 4,500,000
Lake Houston Additional Yield	2010	13,500	$ 0
Freeport Seawater Desalination	2020	33,600	$ 255,699,000
Luce Bayou IBT Conveyance	2020	N/A	$ 239,000,000
Wastewater Reuse for Industry	2020	67,200	$ 234,158,000
Allens Creek Reservoir	2030	99,700	$ 170,040,000
Brazos Saltwater Barrier	2030	N/A	$ 30,300,000
TRA to Houston Contract	2030	150,000	see Luce Bayou
TRA to SJRA Contract	2030	50,000	see Luce Bayou
Houston to GCWA Transfer	2050	28,000	$ 102,382,000
Houston Indirect Wastewater Reuse	2050	98,000	TBD
Little River Off-Channel Reservoir	2050	32,100	$ 96,512,000
NHCRWA Indirect Wastewater Reuse	2060	31,400	TBD
New San Jacinto River Water Rights	2010	0	$ 0
New Harris County Bayous Water Rights	2010	0	$ 9,013,000
Total			$ 1,137,677,000

The distribution of costs over the planning period is shown in Figure 9-1. WUG-level costs for surface water treatment and distribution infrastructure are shown as fully occurring in the first decade in which facilities are required. This accounts for the lack of WUG-level infrastructure costs corresponding with the WMS costs in the later decades. Many of these costs will actually be phased in over time, particularly those for water treatment plants. A significant portion of the overall infrastructure will be built before 2030 due to groundwater reduction regulations, as discussed below. The Regional Water Authorities / City of Houston cost projection reflects meeting the surface water conversion milestones in Harris County as a result of Harris-Galveston Subsidence District regulations.

Table 9-2: Total Supply and Transmission Cost

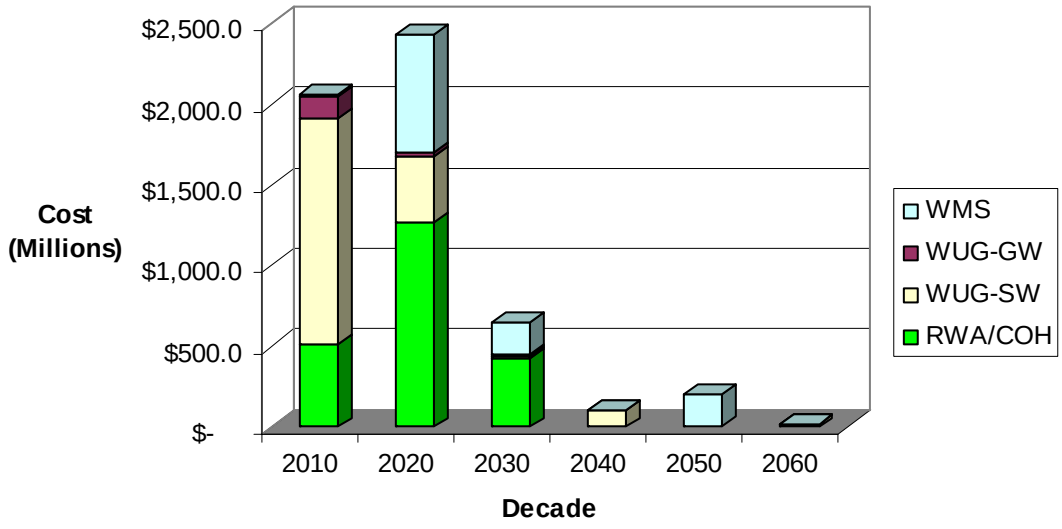
		Cost		
		GW	***SW***	***Total***
Water Supply	WUG	$174,697,700	$1,942,120,200	$2,116,817,900
	WWP (WMS)			$1,137,677,000
	Total Supply Infrastructure Cost for Recommended Strategies			**$3,254,494,900**
Water Transmission	City of Houston[1]			$623,100,000
	NHCRWA[2]			$800,000,000
	WHCRWA[3]			$792,605,000
	Total Transmission Infrastructure Cost			**$2,215,705,000**
Total Supply and Transmission Infrastructure Cost				**$5,470,199,900**

1 City of Houston water transmission infrastructure costs, period 2007 - 2030, are based on *City of Houston Water Production Optimization Study*, CDM, October 2002.

2 NHCRWA water transmission infrastructure costs are based on information obtained from the NHCRWA Consultant Team

3 WHCRWA water transmission infrastructure costs are based on information obtained from the WHCRWA Consultant Team

Figure 9-1: Costs by Decade and Category



WUG infrastructure costs occur early in the planning period due to the availability and predominant use of groundwater. The ability to easily drill groundwater wells throughout the region has allowed development to occur at significant distances from surface water sources. As projected water demands surpass the sustainable yield of the Gulf Coast Aquifer, communities now face the need to construct long pipelines and treatment facilities.

Regulatory Plans enacted by the Harris-Galveston Subsidence District and the Fort Bend Subsidence District limit groundwater use to a percentage of total demand within those counties. Surface water conversion milestones are mandated in 2020 and 2030 for Harris County, and in 2013 and 2025 in Fort Bend County. Montgomery County is not under a GRP, but is projected to begin utilizing surface water as well by 2010.

Water conservation is a major component of the Region H Water Plan, accounting for 179,100 acre-feet per year of reduced demand. Irrigation conservation is recommended in six counties, with potential reductions ranging from 10 to 28 percent of demand. These savings are to be achieved through the lining of irrigation canals, and the laser-leveling of rice fields. Both of these methods require capital infrastructure, totaling $573,000 over the six counties.

Municipal conservation does not require capital infrastructure, but incurs a cost per acre-foot to achieve the target savings. Depending upon the size of the WUG, conservation is estimated as reducing demand by 5.5 to 7 percent, at a cost of $154 to $161 per acre-foot (or $0.47 to $0.49 per thousand gallons). This cost per acre-foot of savings is used in the strategy tables in Chapter 4. However, the cost of conservation measures would be paid as an incremental addition to the rate for water actually sold and consumed. As an incremental increase to the existing unit water rates, conservation costs range from $8.96 to $12.12 per acre foot (or $0.028 to $0.037 per thousand gallons).

9.3 Summary of Survey Responses

Surveys were sent to 176 districts and municipalities and 3 wholesale water providers with projected water shortages and anticipated capital costs in the 2006 Region H Water Plan. Of these, 36 surveys were completed and returned. Water User Groups that did not correspond to a single Political Subdivision, such as unincorporated areas and non-municipal WUGs, were sent to the county judge. Per the TWDB format, only those strategies that required capital infrastructure were included on the surveys. The responses received are tabulated in Appendix A, and the completed questionnaires are at Appendix B.

9.3.1 Municipal Water User Groups

Survey responses were received from 29 districts and municipalities. Although each response was unique, several trends were apparent.

First, the majority of municipal utility districts responding indicated that they were built-out or nearly built-out, and they did not intend to extend service into adjacent areas. This is to be expected in this portion of the state, where groundwater from the Gulf Coast Aquifer has been readily available. Developers of single subdivisions up to master-planned communities have formed utility districts to provide water and sewer service within these new communities. Adjacent development typically forms an adjacent utility district. Future districts will absorb most of the projected population growth in the Municipal County-Other WUGs. As discussed in Chapter 2, a survey was conducted in 2002 to allow the Region H WUGs to review and comment on the population projections, and revisions were made based upon the responses received. It is apparent that not all districts responded to that earlier survey. For the sake of this survey, a shift from growth within existing districts to the formation of new districts reduces the potential for state loan requests. New districts serving

new development generally issue bonds to finance their initial infrastructure, while existing districts may rely on State Grants or Revolving Fund Loans for system expansions.

Second, many districts in areas with limited or regulated groundwater use indicated they would participate in a collective GRP. Under these plans, some participants would over-convert to surface water while others remained on groundwater. All participants would pay a set water-use fee to fund the requisite surface water infrastructure. Collectively, the group would remain within the limited or regulated groundwater capacity of the Gulf Coast Aquifer. By only converting certain areas to surface water, collective GRPs are less costly than plans for conversion of all WUGs. The distribution of costs through water-use fees reduces the need for infrastructure grants from the state. The GRPs cited in the responses included the North Harris County Regional Water Authority, the West Harris County Regional Water Authority and the City of Houston (which includes some adjacent districts). Within Fort Bend County, several responding districts are within the new North Fort Bend Regional Water Authority, and the Cities of Richmond and Rosenberg cited an on-going study which may result in an additional regional system.

Finally, the regional water authorities and the majority of municipalities expect to finance their capital infrastructure through bonds. The Drinking Water State Revolving Fund was the state program most often identified for potential use. Riverside WSC noted that they would like to utilize Texas Department of Housing and Community Affairs grants, but the program lacks funds to meet all of the identified needs. The Brazos River Authority identified State Participation for use in major projects (specifically Allens Creek Reservoir, Little River Off-Channel Reservoir and Freeport Desalination).

9.3.2 Non-Municipal Water User Groups

Non-municipal WUG demands are aggregated at the County and Basin level. Surveys for these WUGs were sent to County judges, because no single entity represents these collective WUGs. The surveys addressed the capital costs for water supply, but not for distribution because specific destinations were not identified. The County responses were non-committal, pointing out that county government is not responsible for providing water supply. It is expected that within the non-municipal water use categories, local infrastructure will be funded using a combination of the methods outlined below, which come from a review of existing funding programs and information contained in previous water plans.

Manufacturing: Projected water shortages for manufacturing occur due to projected growth exceeding available local supply (usually groundwater) and in some counties, regulatory limits reducing the availability of groundwater. It is anticipated that those companies with projected shortages will coordinate directly with the surface water providers identified for any infrastructure needed to bring water to their sites. The funding of this construction may occur in a number of ways. The typical method is for the water provider to construct the distribution system supplying its customers, and pass through the cost in the water rate. State assistance may be requested through the State Loan Program for some projects, particularly the Freeport Seawater Desalination Plant. A second funding option is for the manufacturer to directly construct the required infrastructure to connect to a provider's supply. This would be a site-specific decision. In areas not currently served by a surface water provider, a private developer may chose to establish a distribution utility, or a public-private partnership may be formed between the water supplier and end user to develop a new system.

Steam Electric Power: Steam Electric Power is projected to increase in direct proportion to population and manufacturing growth, and with it the associated water demand. Shortages in water supply for power are projected to be met through expanded use of groundwater and/or increased use of surface water from current wholesale providers. It is expected that the power plant owners, as a part of any facility upgrades they may make, will include the required water supply intakes and pipelines or contract directly with existing major water providers to obtain the needed additional water.

Mining: Mining is projected to experience water shortages in twelve counties, although the needs in six of those can be met through expanded use of groundwater. Any well costs would be borne by the private mining company. In the remaining six counties, a new or increased contract for surface water from current wholesale providers is recommended. It is anticipated that those companies with projected shortages will coordinate directly with the surface water providers identified for any infrastructure needed to bring water to their sites. The cost of this infrastructure is expected to be paid by the private mining entities.

Irrigation: Anticipated infrastructure costs for irrigation are related to the irrigation conservation management strategy, which includes such measures as canal lining, upgrading to more efficient irrigation systems and laser-leveling fields. Individual irrigators would predominantly fund these measures, with assistance from the State through the Agricultural Water Conservation Loan Program. This program requires the funds to be requested through a soil and water conservation district, underground water conservation district or an authorized supplier of water for irrigation, which would then manage the projects locally. Since small irrigators may be unable to assume full financial liability for these improvements, subsidies or grants from the State and/or the water providers may be needed to ensure these improvements are made. In Waller County, irrigation conservation is used to off-set increased municipal use of groundwater. Therefore, a local government agency must be identified to ensure conservation occurs in that county.

Table 9A-1
Infrastructure Financing Survey Responses

								Spreadsheet for Compiling Infrastructure Finance Data from Political Subdivision with Needs										
							IF 'NO'	IF 'YES'----->										
RWPG	Name of Political Subdivision	Recommended Project/Strategy	Implementation Date	Capital Cost to be paid by Political Subdivision	ID # from DB07	Planning on Implementing the recommended Strategy? (Y/N)	*If 'no' explaination of how they will meet future water needs.*	% Cash Reserves	% Bonds	% Bank Loans	% Government Programs - Federal	% Government Programs - State	% Other	*Other' explanation*	TOTAL % (should be 100%)	Name of Contact Person	Title	Phone
H	ALVIN	Expanded use of Groundwater	2010	$ 1,822,600	H19-EXPGW	Y						75%	25%	Impact fees	100%	David Kocerek	Director of P.W.	(281) 388-4315
H	AUSTIN COUNTY-OTHER	Expanded use of Groundwater	2010	$ 1,528,800	H19-EXPGW	N	As discussed with Glenda Callaway and the Bluebonnet Groundwater District Director, Texas Counties have no authority for water infrastructure. We do recognize the needs of agriculture and other county water consumers, bu have no public funds to meet.						X		0%	Carolyn Bilski	Austin Co Judge	(979) 865-5911
H	AUSTIN MANUFACTURING	Expanded use of Groundwater	2010	$ 416,000	H19-EXPGW	N	As discussed with Glenda Callaway and the Bluebonnet Groundwater District Director, Texas Counties have no authority for water infrastructure. We do recognize the needs of agriculture and other county water consumers, bu have no funds.						X		0%	Carolyn Bilski	Austin Co Judge	(979) 865-5911
H	BRAZOS RIVER AUTHORITY	Freeport Desalination Plant	2010	$ 85,233,000	H20-DESAL1	Y	See attachment containing additional information regarding implementation of the Freeport Desalination Plant. Also note that the Capital Cos shown above was reduced to reflect the 10 MGD configuration that is recommended through 2040 in the Initially Prepared Region H Plan.					25%	75%	State participation	100%	David Wheelock	Water Services Mgr	(254) 761-3158
H	BRAZOS RIVER AUTHORITY	Allens Creek Reservoir	2030	$ 51,012,000	H05-ALLENS	Y			50%			50%		State participation	100%	David Wheelock	Water Services Mgr	(254) 761-3158
H	BRAZOS RIVER AUTHORITY	Brazos Saltwater Barrier	2030	$ 30,300,000	H21-BRSWB	Y			25%		50%		25%	Local Partners	100%	David Wheelock	Water Services Mgr	(254) 761-3158
H	BRAZOS RIVER AUTHORITY	Little River Off-Channel Reservoir	2050	$ 96,512,000	HG03LRIV2	Y	Note that implementation date was corrected to 2050 to match Initially Prepared Plan		50%			50%		State participation	100%	David Wheelock	Water Services Mgr	(254) 761-3158
H	CHAMBER COUNTY - IRRIGATION	Irrigation Conservation	2010	$ 212,922	H03-IRRCON	Y		50%				50%		Agriculture grants & loans	100%	Pudge Wilcox	General Manager, CLCND	(409) 267-3541
H	CRYSTAL SPRINGS WATER COMPANY	Expanded use of Groundwater	2010	$ 1,220,600	H19-EXPGW	N	My system is handled by 2 existing wells with no (or very little) growth anticipated. Each system handles only a small number of customers in "bui out" subdivisions.								0%	Tom Martin (sp?)	President	(281) 354-5136
H	CUT AND SHOOT	Expanded use of Groundwater	2010	$ 1,376,300	H19-EXPGW	Y		10%			90%					Lang Thompson	Mayor	(936) 264-3100
H	DAYTON	Expanded use of Groundwater	2010	$ 1,523,500	H19-EXPGW	Y	City intends to purchase surface water rights	25%	25%		285%	25%			100%	Brian LaBarde (sp?)	City Planner	(936) 258-2642
H	FORT BEND COUNTY MUD #41	Allens Creek Reservoir	2030	$ 2,545,907	H05-ALLENS		We are part of the North Authority and will pay pumpage fees to the NFBRWA. Our production is expected to be ~3500, not 25,000.						100%	Fees paid to NFBRWA	100%	Cindy Albers, PE	District Engineer	(713) 777-5337
H	FORT BEND COUNTY MUD #41	Expanded use of Groundwater	2010	$ 416,000	H19-EXPGW		We are part of the North Authority and will pay pumpage fees to the NFBRWA. Our production is expected to be ~3500, not 25,000.						100%	Fees paid to NFBRWA	100%	Cindy Albers, PE	District Engineer	(713) 777-5337
H	FORT BEND COUNTY MUD #41	BRA System Operations	2010	$ 11,226,957	HG01BRASYS		We are part of the North Authority and will pay pumpage fees to the NFBRWA. Our production is expected to be ~3500, not 25,000.						100%	Fees paid to NFBRWA	100%	Cindy Albers, PE	District Engineer	(713) 777-5337
H	FORT BEND COUNTY MUD #81						Called Ekistics on 13 SEP. Will send response.											
H	FULSHEAR	BRA System Operations	2010	$ 3,345,545	HG01BRASYS	N	The required future needs would be met by receiving federal funding.									Kathy Mayfield	City Secretary	
H	GALENA PARK	TRA-Houston Transfer	2020	$ 26,329	H10-TRAXFR	Y	50 to 100%								100%	John Cooper	City Administrator	(713) 672-2556
H	HARRIS COUNTY WCID #133	TRA-Houston Transfer	2020	$ 86,909	H10-TRAXFR	N	See attachment - Summarized: district is built out and is participating in the City of Houston GRP (remaining on groundwater, but paying a fee).									Nathan Adams	Graduate Engineer	(281) 350-7027
H	HARRIS COUNTY WCID #133	New Contracts	2010	$ 2,637,843	H27-NWCUST	N	See attachment - Summarized: district is built out and is participating in the City of Houston GRP (remaining on groundwater, but paying a fee).									Nathan Adams	Graduate Engineer	(281) 350-7027
H	HEDWIG VILLAGE	New Contracts	2010	$ 2,063,989	H27-NWCUST	N	Water needs served by Memorial Villages Water Authority. City of Hedwig Village has no water or wastewater.									Beth Staton	City Administrator	(713) 465-6009
H	HUNTSVILLE	Expanded use of Groundwater	2010	$ 1,543,900	H19-EXPGW	Y	City noted 12 wells totalling $40,000,000 on survey form.		100%						100%	Jason Pierce	Water Superintendant	(936) 294-5762
H	KATY	TRA-Houston Transfer	2020	$ 980,231	H10-TRAXFR		The City of Katy is under the West Harris Coutny Regional Water Authority											
H	KATY	Lake Houston Additional Yield	2010	$ 29,576,495	H15-HOUYLD		The City of Katy is under the West Harris Coutny Regional Water Authority											
H	LAKE JACKSON	Expanded use of Groundwater	2010	$ 1,393,500	H19-EXPGW	N	This project is not needed as the City of Lake Jackson already has infrastructure in place to produce more groundwater than called for in the plan. We will be providing written comments on the plan to have our actual groundwater capability recognized in the plan.									Craig Nesbitt	Public Works Director	(979) 415-2430

Table 9A-1
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								Spreadsheet for Compiling Infrastructure Finance Data from Political Subdivision with Needs										
							IF 'NO'	IF 'YES'----->										
RWPG	Name of Political Subdivision	Recommended Project/Strategy	Implementation Date	Capital Cost to be paid by Political Subdivision	ID # from DB07	Planning on Implementing the recommended Strategy? (Y/N)	If 'no' explaination of how they will meet future water needs.	% Cash Reserves	% Bonds	% Bank Loans	% Government Programs - Federal	% Government Programs - State	% Other	Other' explanation	TOTAL % (should be 100%)	Name of Contact Person	Title	Phone
H	LAKE LIVINGSTON WATER SUPPLY & SEWER SERVICE CO.	Expanded use of Groundwater	2010	$ 1,842,400	H19-EXPGW		At present, LLWS&SSC has a loan application with the Texas Drinking Water State Revolving Fund for $7,895,000. Also, LLWS&SSC has additional water systems not covered by Region H.									John Gonzer (sp?)	Financial Officer	
H	LIBERTY	Expanded use of Groundwater	2010	$ 416,000	H19-EXPGW	Y	We are also exploring the cost effectiveness of surface water.	TBD				TBD		SRF Certificates - CDBG		Allen L. Barnes	City Manager	(936) 336-8188
H	LONGHORN TOWN UD	TRA-Houston Transfer	2020	$ 209,234	H10-TRAXFR	N	Longhorn Town UD has entered into a GRP with the City of Houston. Additionally, the existing water plant is sufficient to serve existing and projected development within the district.						100%	Rate structure as defined in GRP	100%	Greg Lentz, P.E.	Project Manager	(713) 461-9600
H	LONGHORN TOWN UD	Expanded use of Groundwater	2010	$ 5,952,444	H19-EXPGW	N	See previous						100%	Rate structure as defined in GRP	100%	Greg Lentz, P.E.	Project Manager	(713) 461-9600
H	MADISONVILLE	Expanded use of Groundwater	2010	$ 416,000	H19-EXPGW		Without more time, frankly I don't even know where you came up with the $416,000.									Tom Ginter	City Manager	(936) 348-2748
H	MONTGOMERY COUNTY MUD NO. 8	Expanded use of Groundwater	2010	$ 416,000	H19-EXPGW	Y	The district will comply with recommended compliance requirements, but do not anticipate such compliance will require the District to obtain surface water as other means of compliance would be utilized, such as paying pumpage fees, etc.	5%				5%		Drinking Water State Revolving Fund, if qualified. Otherwise stated water loan programs	100%	Ross J. Radcliffe	Attorney for MCMUD 8	(713) 237-1221
H	MONTGOMERY COUNTY MUD NO. 8	New Contracts	2020	$ 8,041,900	H27-NWCUST	Y	See previous	5%				5%		Drinking Water State Revolving Fund, if qualified. Otherwise stated water loan programs	100%	Ross J. Radcliffe	Attorney for MCMUD 8	(713) 237-1221
H	MONTGOMERY COUNTY MUD NO. 9	Expanded use of Groundwater	2010	$ 1,381,000	H19-EXPGW	Y	MUD 9 has budgetted funds for the construction of a new water well.	100%						The district has escrowed bond funds on-hand for the construction of an additional water well.	100%	Jonathon K. Frels	Attorney	(713) 758-4754
H	MONTGOMERY COUNTY MUD NO. 9	New Contracts	2020	$ 9,026,500	H27-NWCUST	Y	While the District anticipates the development of a regional approach to the conversion from groundwater to surface water in which the district will participate, the District does not foresee converting to surface water given its location. As a result, the District does not anticipate capital expenses related to the conversion to surface water at this time.					100%		If the District has capital costs associated with a conversion to surface water, it will likely seek funding through the Water and Wastewater Loan Program or the State Drinking Water Revolving Fund.	100%	Jonathon K. Frels	Attorney	(713) 758-4754
H	MONTGOMERY COUNTY UD NO. 2	New Contracts	2020	$ 2,647,400	H27-NWCUST	N	The District is currently under the Lone Star Groundwater Conservation District jurisdiction for surface water compliance. To date, Lone Star ha not adopted a plan for transferring to surface water, so the District does not have conversion amount information or deadlines. The infrastructure for surface water conversion for this area is proposed to be designed and installed by the San Jacinto River Authority (SJRA). Until a a conversion plan is adopted, the SJRA cannot finalize an infrastructure plan, so the District does not know the extent of financial participation that will be required to connect to the future surface water system. Therefore, the District is unable to completely answer this survey at this time.									Nathan Adams	Graduate Engineer	(281) 350-7027
H	NORTH HARRIS COUNTY REGIONAL WATER AUTHORITY	TRA-Houston Transfer	2020	$ 11,424,922	H10-TRAXFR	Y			100%						100%	Jimmie Schindewolfe, P.E.	General Manager	(281) 440-3924
H	NORTH HARRIS COUNTY REGIONAL WATER AUTHORITY	New Contracts	2020	$ 1,007,394,970	H27-NWCUST	Y			100%						100%	Jimmie Schindewolfe, P.E.	General Manager	(281) 440-3924
H	NORTH MISSION GLEN MUD	Allens Creek Reservoir	2030	$ 2,810,395	H05-ALLENS	N	The District has constructed facilities adequate to supply water to the service area. The district also plans to join a groundwater reduction plan within the time frame specified by the Fort bend Subsidence District 2003 Regulatory Plan.									Robert Wempe, P.E.	Project Director, Turner Collie & Braden	(713) 267-3189
H	NORTH MISSION GLEN MUD	Expanded use of Groundwater	2010	$ 416,000	H19-EXPGW	N	See previous									Robert Wempe, P.E.	Project Director, Turner Collie & Braden	(713) 267-3189
H	NORTH MISSION GLEN MUD	BRA System Operations	2010	$ 11,514,487	HG01BRASYS	N	See previous									Robert Wempe, P.E.	Project Director, Turner Collie & Braden	(713) 267-3189

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								Spreadsheet for Compiling Infrastructure Finance Data from Political Subdivision with Needs										
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H	PANORAMA VILLAGE	New Contracts	2020	$ 3,062,500	H27-NWCUST	N	The City of Panorama Village is near build out, with approximately 300 lots available for additional population growth. Current capacity of the City's well system is 2.8 mgd. During the month of June, our maximum daily pumping never exceeded 40% of our capacity, even though this was the driest and hottest June on record. If Panorama Village does completely build out the remaining lots, it is anticipated that the City's existing supply will be sufficient to meet these growth needs. As always, the City intends to continue promoting water conservation in Panorama Village as stewards of our most precious natural resource.									Dale E. Evans	Council Position No. 2	(936) 856-2821
H	PEARLAND	Allens Creek Reservoir	2030	$ 6,825,489	H05-ALLENS	Y			100%						100%	Bill Eisen	City Manager	(281) 652-1663
H	PEARLAND	TRA-Houston Transfer	2020	$ 17,326,868	H10-TRAXFR	Y			100%						100%	Bill Eisen	City Manager	(281) 652-1663
H	PEARLAND	Expanded use of Groundwater	2020	$ 3,066,600	H19-EXPGW	Y			100%						100%	Bill Eisen	City Manager	(281) 652-1663
H	PINEY POINT VILLAGE	TRA-Houston Transfer	2020	$ 58,250	H10-TRAXFR	N	Piney Point Village owns no water facilities. Our residents are served by Memorial Villages Water Authority, a separate governmental agency.									Mike Montgomery	General Manager, MVWA	(713) 465-8318
H	PINEY POINT VILLAGE	New Contracts	2010	$ 2,983,194	H27-NWCUST	N	Piney Point Village owns no water facilities. Our residents are served by Memorial Villages Water Authority, a separate governmental agency.									Mike Montgomery	General Manager, MVWA	(713) 465-8318
H	RICHMOND	Allens Creek Reservoir	2030	$ 1,235,413	H05-ALLENS	N	The BRA is working with stakeholders to locate a surface water treatment plant in our area.									R. Gilmore	City Manager	(281) 342-5456
H	RICHMOND	BRA System Operations	2010	$ 8,714,319	HG01BRASYS	N	The BRA is working with stakeholders to locate a surface water treatment plant in our area.									R. Gilmore	City Manager	(281) 342-5456
H	RIVER PLANTATION MUD	New Contracts	2010	$ 3,830,500	H27-NWCUST	N	District is built out and has no room to expand. Population has not increased since 2000. Please flat line any projected growth for the future.									Richard Ramirez	District Manager	(936) 273-4641
H	RIVERSIDE WSC	Expanded use of Groundwater	2010	$ 398,600	H19-EXPGW	Y	We will need more than $398,600 just to install the elevated storage tank. Our customer accounts have increased 400 in the last 3 years. We are drilling new wells.			40%		50%	10%	Raise water rates. TDCHA - local grants. We would like to see funding be made available at local levels One RWSC gets all grants every year.	100%	David Weinkauf	General Manager	(936) 594-5793
H	ROSENBERG	Allens Creek Reservoir	2030	$ 3,849,575	H05-ALLENS	Y	City is a stakeholder with BRA, City of Richmond, Pecan Grove MUD, New Territory MUDs and Greatwood MUDs in the preparation of a feasibility study for a Regional Surface Water Plant in this area. The study will also look at appropriate conversion credit options. This study will better define a strategy and this information can be provided to region H. The projected completion date of the study is October 2005.		75%			25%		Drinking Water State Revolving Fund, State Participation in Regional Water and Wastewater Facilities, and the Water and Wastewater Loan Program	100%	Cathy Ezell	Finance Manager	(832) 595-3350
H	ROSENBERG	BRA System Operations	2010	$ 19,563,566	HG01BRASYS	Y	See previous		75%			25%		Drinking Water State Revolving Fund, State Participation in Regional Water and Wastewater Facilities, and the Water and Wastewater Loan Program	100%	Cathy Ezell	Finance Manager	(832) 595-3350
H	SEALY	Expanded use of Groundwater	2010	$ 1,361,800	H19-EXPGW	Y		20%	80%						100%	John Maresh	City Manager	(979) 885-3511
H	TOMBALL	TRA-Houston Transfer	2020	$ 1,298,975	H10-TRAXFR	Y							100%	North Harris County Regional Water Authority	100%	Roderick J. Hainey	Director of P.W.	(281) 290-1415
H	TOMBALL	Lake Houston Additional Yield	2010	$ 23,278,511	H15-HOUYLD	Y							100%	North Harris County Regional Water Authority	100%	Roderick J. Hainey	Director of P.W.	(281) 290-1415
H	TRAIL OF THE LAKES MUD	TRA-Houston Transfer	2020	$ 246,281	H10-TRAXFR		Attached memo: I am returning herewith your correspondence regarding updates to the Region H Water Planning Group Regional Water Plan. Please be advised that the captioned district is in the West Harris County Regional Water Authority and not the Region H Water Planning Group.									Marilyn Roberts	Vinson & Elkins	(713) 758-2852
H	TRAIL OF THE LAKES MUD	Expanded use of Groundwater	2010	$ 546,000	H19-EXPGW		See previous									Marilyn Roberts	Vinson & Elkins	(713) 758-2852
H	TRAIL OF THE LAKES MUD	New Contracts	2010	$ 5,167,525	H27-NWCUST		See previous									Marilyn Roberts	Vinson & Elkins	(713) 758-2852

Table 9A-1
Infrastructure Financing Survey Responses

							IF 'NO'	Spreadsheet for Compiling Infrastructure Finance Data from Political Subdivision with Needs IF 'YES'----->											
RWPG	Name of Political Subdivision	Recommended Project/Strategy	Implementa-tion Date	Capital Cost to be paid by Political Subdivision	ID # from DB07	Planning on Implementing the recommended Strategy? (Y/N)	*If 'no' explaination of how they will meet future water needs.*	% Cash Reserves	% Bonds	% Bank Loans	% Government Programs - Federal	% Government Programs - State	% Other	*Other' explanation*	TOTAL % (should be 100%)	Name of Contact Person	Title	Phone
H	WEST HARRIS COUNTY REGIONAL WATER AUTHORITY	TRA-Houston Transfer	2030	$ 711,815	H10-TRAXFR	Y	Added capital cost of $7,601,392 to this WMS.	1%	99%					If plans change in the future, WHCRWA reserves the right to use SRF/TWDB programs	100%	Wayne G. Ahrens	Engineer	(713) 527-6378
H	WILLIS	New Contracts	2020	$ 3,914,600	H27-NWCUST	Y	Contract with SJRA via City of Conroe, if necessary.	10%	90%					Will use state/federal programs, if available	100%	J. McAlister	Administrator	(936) 856-4611
H																		
H																		

REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

TO POLITICAL SUBDIVISIONS WITH WATER NEEDS IN REGION H

The Region H Water Planning Group (RHWPG) is currently updating the Regional Water Plan. Your political subdivision is projected to have water demands that exceed the currently available water supply during the 50-year planning period. This may be due to projected population and demand growth, limitations on groundwater use, or a combination of the two.

The RHWPG is recommending a combination of water conservation, expanded use of groundwater and new or existing surface water supplies to meet the projected water demands. These recommendations are summarized on the attached tables, which are excerpted from the tables in the Initially Prepared Plan. In these tables, it is assumed that surface water will be treated and distributed through regional facilities, with individual water user groups paying a pro-rata share of the regional infrastructure costs. Local infrastructure (new wells, distribution mains and related equipment) will be funded and constructed by the political subdivision.

The Texas Water Code requires the Regional Water Planning Groups to survey all political subdivisions with projected water needs about infrastructure financing. The goal of the survey is to determine State funding levels for existing infrastructure loan and grant programs, and to identify any areas not addressed by current programs. For your reference, a list of existing loan and grant programs is included with this survey packet.

Please return the completed survey by <u>July 29, 2005</u> to:

Region H Water Planning Group
c/o Ekistics Corporation
2727 Kirby Drive, Suite 523
Houston, Texas 77098
713-520-8150 facsimile
E-mail address: glencall@aol.com

If you have any questions regarding this survey, please contact: Glenda Callaway at 713-520-9031 or Andrew Sterbenz, KBR, at 713-753-3718.

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group ___**Region H Water Planning Group**_____

Political Subdivision (WUG or WWP)_____

Contact Person_____

Recommended Project/Strategy	***Management Strategy ID#***	***Date Strategy is to be Implemented***	***Capital Cost to be paid by Political Subdivision***
TOTAL COST OF CAPITAL IMPROVEMENTS		$	

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

YES ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

% _____ TOTAL – (Sum should equal 100%)

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

_____	_____	_____
Name	Title	Phone

Texas Water Development Board

Financial Assistance Programs

Public Works Infrastructure Construction

Clean Water State Revolving Fund Loan Program

- Type: Loan
- Uses: Planning, acquisition and construction, wastewater treatment, stormwater and nonpoint source pollution control, and reclamation/reuse projects.
- Applicants: Political Subdivisions. Individuals are eligible to apply for non-point source pollution control projects.
- Availability: An annual priority rating process applies to projects.

Drinking Water State Revolving Fund Loan Program

- Type: Loans and additional subsidies (subsidies are for disadvantaged communities only)
- Uses: Planning, acquisition and construction of water related infrastructure, including water supply and Source Water protection.
- Applicants: Community water system owners and Nonprofit Non-Community water system owners are eligible to apply for the funding. This includes political subdivisions of the state and private individuals.
- Availability: An annual priority rating process applies to projects.

Rural Water Assistance Fund Program

- Type: Loan
- Uses: Planning, acquisition and construction of water supply related infrastructure, including water treatment, water distribution pipelines, reservoir construction, and storage acquisition. May also be used for water quality enhancement projects such as wastewater collection and treatment systems.
- Applicants: Political Subdivisions and Nonprofit Water Supply Corporations.
- Availability: Not restricted.

State Participation in Regional Water and Wastewater Facilities Program

- Type: Deferred interest loan (State has a temporary ownership interest in a facility. State's ownership is purchased by applicant as their customer base grows.)
- Uses: Construction of regional water or wastewater construction project when the local sponsors are unable to assume debt for the optimally sized facility.
- Applicant: Political Subdivisions of the State and Water Supply Corporations which are sponsoring construction of a regional water or wastewater project can apply for funding.
- Availability: Limited Funds.

Water and Wastewater Loan Program

- Type: Loan
- Uses: Planning, acquisition and construction of water related infrastructure, including water supply, wastewater treatment, stormwater and nonpoint source pollution control, flood control, reservoir construction, storage acquisition, and agricultural water conservation projects, and municipal solid waste facilities.
- Applicants: Political Subdivisions and Nonprofit Water Supply Corporations.
- Availability: Not restricted.

Colonias

Economically Distressed Area Program for Water and Sewer Service

- Type: Grant, loan, or a combination grant/loan.
- Uses: To bring water and wastewater services to economically distressed areas (designated by TWDB) where the present water and wastewater facilities are inadequate to meet the minimal needs of residents. The program includes measures to prevent future substandard development.
- Applicants: Political subdivisions, and nonprofit water supply corporations, provided they meet certain program requirements.
- Availability: Limited Funds.

Colonia Plumbing Loan Program

- Type: Low-interest loan.
- Uses: assist low-to-moderate income colonia residents with financing plumbing connections to water and wastewater (sewer) systems and with installation of necessary plumbing improvements within their homes.
- Applicants: Local political subdivisions including cities, counties, water districts, water authorities, and non-profit water supply corporations in designated counties.
- Availability: Limited Funds.

Community Self-Help Program for Water and Sewer

- Type: Grant
- Uses: Actual cost to acquire water and wastewater systems to provide adequate service to Colonias where the local residents provide volunteer labor (sweat equity) to construct the facilities, and/or donate equipment, materials, and supplies. The dollar value of the assistance provided by the local residents must be at least 40% of the total amount of the cost of the project.
- Applicants: political subdivisions, including cities, counties, water districts, and nonprofit water supply corporations within Affected Counties (specified by statute).
- Availability: Limited Funds.

Flood Mitigation

Federal Emergency Management Agency Flood Mitigation Assistance

- Type: Grant
- Uses: Planning assistance to communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). Eligible work includes: Acquisition of insured structures and real property; Relocation or demolition of insured structures; Dry flood proofing of insured structures; Elevation of insured structures; Minor, localized structural projects that are not fundable by State or other Federal programs; and Beach nourishment activities such as planting of dune grass.
- Applicants: Political subdivision, including any Indian or authorized tribal or native organization, that has zoning and building code jurisdiction over a particular area having special flood hazards, and is participating in the NFIP. Communities that are suspended or on probation from the NFIP are not eligible. A community applying for a FMA Project Grant must have an approved Flood Mitigation Plan.
- Availability: Dollar limits apply to each application.

Flood Protection Planning

- Type: Grant
- Uses: Evaluation of structural and nonstructural solutions to flooding problems and considers flood protection needs of the entire watershed. Upstream and/or downstream effects of proposed solutions must be considered in the planning. The proposed planning must be regional in nature by inclusion of an entire watershed.
- Applicants: Political subdivisions of the State of Texas with the legal authority to plan for and implement flood protection measures, and that are members of the National Flood Insurance Program.
- Availability: Projects compete annually for funding.

Groundwater - Natural Resources

Groundwater Conservation District Startup Loan Program

- Type: Loan
- Uses: Finance the start-up costs (salaries and payroll taxes; utilities; travel; insurance; building and office leases; office supplies and furniture; telephone and computer equipment; and legal and professional fees) of Groundwater Conservation Districts.
- Applicants: District or authority created under the Texas Constitution, Section 52, Art. III, or Section 59, Article XVI, that has the authority to regulate the spacing of water wells, the production from water wells, or both. The district must be a newly confirmed district or legislatively created district that does not require a confirmation election.
- Availability: Limited Funds.

Planning

Regional Facility Planning Grant Program

- Type: Grants
- Uses: Studies and analyses to evaluate and determine the most feasible alternatives to meet regional water supply and wastewater facility needs, estimate the costs associated with implementing feasible regional water supply and wastewater facility alternatives, and identify institutional arrangements to provide regional water supply and wastewater services for areas in Texas.
- Applicants: Political subdivisions with the legal authority to plan, develop, and operate regional facilities, and nonprofit water supply corporations.
- Availability: Projects compete annually for funding.

Regional Water Planning Group Grants

- Type: Grant
- Uses: planning activities for the long term water supply needs of Texas. Fundable tasks include determining future water demands, availability of future water supplies, and identifying solutions to meet demands. Funds are periodically available.
- Applicants: Political Subdivisions predesignated by the 16 Regional Water Planning Groups in the state.
- Availability: Limited Funds.

Research

Water Research Grant Program

- Type: Grant
- Uses: Water research that addresses one of the Texas Water Development Board's designated research topics published in its most recent Request For Proposals.
- Applicants: Individuals, political subdivisions of the state, and nonprofit water supply corporations are eligible to apply for funding.
- Availability: Annual application process published with Request for Proposals.

Agriculture

Agriculture Water Conservation Grants

- Type: Grant (up to 100%)
- Uses: demonstrations, education, research, technical assistance, and technology transfer. Grants may also be made to political subdivisions for agricultural water conservation projects for purchase and installation (on public or private property) of metering devices to measure irrigation water use in order to quantify effects of different water conservation strategies.
- Applicants: State Agencies and Political Subdivisions of the State
- Availability: Annual funding opportunity; Solicitations appear in Texas Register.

Agriculture Water Conservation Loans

- Type: Loan
- Uses: Conservation projects that: 1.) improves water use efficiency of water delivery and application, or 2.) prepares irrigated land for conversion to dry land farming, or 3.) prepares dry land for more efficient use of natural precipitation, or 4.) purchases and installs on public or private property devices designed to indicate the amount of water withdrawn for irrigation use, or 5.) brush control activities conduced under Chapter 203 of Agriculture Code, or 6.) other conservation projects defined by TWDB rules.
- Applicants: Eligible applicants include political subdivisions of the state, institutions of higher education, interstate compact commissions, and nonprofit Water Supply Corporation (Chapter 69 of Water Code), Banks and farm credit system may apply for link deposit funds to make loans available to individuals.
- Availability: Limited Funds.

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

KATY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	980,231
Lake Houston Additional Yield	H15-HOUYLD	2010	29,576,495
TOTAL COST OF CAPITAL IMPROVEMENTS			$30,556,726

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

The City of Katy is under the West Harris County Regional Water Authority.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL -- (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

_____ _____ _____

Name Title Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

DAYTON

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,523,500
Purchase surface water Rights			
~~Pipeline~~			
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,523,500

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☑ % 25 Cash Reserves

☑ % 25 Bonds

☐ % _____ Bank Loans

☑ % 25 Federal Government Programs

☑ % 25 State Government Programs

☐ % _____ Other _____

% _____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs. ?

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Brian La Borde | City Planner | 936-258-2642

Name | Title | Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

LONGHORN TOWN UD

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	209,234
Expanded Use of GW	H19-EXPGW	2010	5,952,444
TOTAL COST OF CAPITAL IMPROVEMENTS			$6,161,678

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☑ ***NO***

If 'no,' describe how you will meet your future water needs.

Longhorn Town UD has entered into a GRP with the City of Houston. Additionally, the existing water plant is sufficient to serve existing and projected development within the DISTRICT.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

- ☐ %_____ Cash Reserves
- ☐ %_____ Bonds
- ☐ %_____ Bank Loans
- ☐ %_____ Federal Government Programs
- ☐ %_____ State Government Programs
- ☑ % 100 Other Rate Structure as defined in GRP.

% _____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

GREG LENTZ, P.E.	PROJ. MANAGER	713-461-9600
Name	Title	Phone

JONES & CARTER, INC.
ENGINEERS • PLANNERS • SURVEYORS
6335 Gulfton, Suite 100
Houston, Texas 77081-1169
TEL 713 777 5337
FAX 713 777 5976

Date 9/15/05	Job No. 5321-205
Attention —	
Re: FBCMUD 41	
Survey	

To Region H Water Planning Group
c/o Ekistics Corporation
2727 Kirby Dr., Ste. 523
Houston, Tx 77098

We are sending you:

☒ **Attached** ☐ **Under separate cover via** _____

The following items:

☐ **Shop drawings** ☐ **Prints** ☐ **Plans** ☐ **Samples**
☐ **Copy of letter** ☐ **Change Order** ☐ **Specifications**

☐ _____

Copies	Date	No.	Description
1			Survey response

These are transmitted as checked below:

☐ **For approval** ☐ **No objections** ☐ **Resubmit** _____ **copies for approval**
☐ **For your use** ☐ **Objections noted** ☐ **Submit** _____ **copies for distribution**
☐ **For review and comment** ☐ **Returned for corrections** ☐ **Return** _____ **corrected prints**
☒ **As requested** ☐ _____
☐ **FOR BIDS DUE** _____ ☐ **PRINTS RETURNED AFTER LOAN TO US**

Remarks This survey was very confusing. FBCMUD 41 is a member of the NFBRWA and will pay the required fees as a member, which would cover their requirements for capital costs.

Copy to _____

Signed Cindy M. Allen

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

FORT BEND COUNTY MUD #41

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Allens Creek Reservoir	H05-ALLENS	2030	2,545,907
Expanded Use of GW	H19-EXPGW	2010	416,000
BRA System Operations	HG01BRASYS	2010	11,226,957
TOTAL COST OF CAPITAL IMPROVEMENTS			$14,188,864

pd for out of fees paid to North

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☐ ***NO*** ☒ DO NOT KNOW

If 'no,' describe how you will meet your future water needs.

We are part of the north authority + will pay out of pumpage fees to the NFBRWA. Our population is expected to be ~ 3500, not 25,000.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☒ %100 Other fees paid to NFBRWA

%100 *TOTAL – (Sum should equal 100%)*

If state government programs are to be ufilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

CINDY ALBERS, PE	DISTRICT ENGINEER	(713) 777-5337
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

IRRIGATION CHAMBERS

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Irrigation Conservation	H03-IRRCON	2010	212,922
TOTAL COST OF CAPITAL IMPROVEMENTS			$212,922

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ % 50 Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ % 50 State Government Programs

☐ %_____ Other_____

% 100 *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

Agriculture Water Conservation Grants

Agriculture Water Conservation Loans

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Rudge Wilcox	Gen Mgr C.L.C.N.D.	409-267-3541

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

ALVIN

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,822,600
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,822,600

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ *YES* ☐ *NO*

If 'no,' describe how you will meet your future water needs.

Please see page 2 for additional information to be provided by the Political subdivision

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☒ %25 State Government Programs

☒ %25 Other Impact Fees

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

David Kocurek	Director of P.W.	(281) 388-4315
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

COUNTY-OTHER AUSTIN

Recommended Project/Strategy	***Management Strategy ID#***	***Date Strategy is to be Implemented***	***Capital Cost to be paid by Political Subdivision***
Expanded Use of GW	H19-EXPGW	2010	1,528,800
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,528,800

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☑ ***NO***

If 'no,' describe how you will meet your future water needs.

As discussed with Glenda Calloway & the Bluebonnet Groundwater District Director, Texas Counties have no authority for water infrastructure We do recognize the needs of agriculture & other county water consumers. but have no public funds to meet

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ % K Other_____

% _____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Carolyn Bilski	Austin Co Judge	9798655911
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

MANUFACTURING AUSTIN

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	416,000
TOTAL COST OF CAPITAL IMPROVEMENTS			$416,000

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☑ ***NO***

If 'no,' describe how you will meet your future water needs.

As discussed with Glenda Calloway + the Bluebonnet Groundwater District Director, Texas Counties have no authority for water infrastructure. We do recognize the needs of agriculture + various county consumers but have no funds

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %__X__ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Carolyn Bilski	Austin County Judge	9798655911

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Wholesale Water Provider):

BRAZOS RIVER AUTHORITY

Recommended Project/Strategy	***Management Strategy ID#***	***Date Strategy is to be Implemented***	***Capital Cost to be paid by Political Subdivision***
Freeport Desalination Plant	H20-DESAL1	2010	$ 85,233,000 ~~255,699,000~~
Allens Creek Reservoir	H05-ALLENS	2030	51,012,000
Brazos Saltwater Barrier	H21-BRSWB	2030	30,300,000
Little River Off-Channel Res.	HG03LRIV2	2060	96,512,000
TOTAL COST OF CAPITAL IMPROVEMENTS			$ 433,523,000

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

✗ ☑ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

✗ See Attachment containing additional information regarding implementation of the Freeport Desalination Plant. Also note that Capital Cost shown above was reduced to reflect the 10 MGD configuration that is recommended through 2040 in the Initially Prepared Region H Plan.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_25_ State Government Programs

☐ %_75_ Other_(See Attached)_

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

State Participation

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
[signature]	WATER SVCS MANAGER	254-761-3158

Attachment to Region H Infrastructure Financing Survey

July 2005

FREEPORT DESALINATION PLANT

This is a proposed *demonstration* project as part of the Governor's seawater desalination initiative. As a *demonstration* project, it is recommended for implementation by 2010; however, assuming other recommended strategies for Brazoria County are implemented, water from the plant would not be needed until much further out in the planning period. The estimated capital cost for the 10 MGD *demonstration* plant as recommended from 2010 – 2040 is $85 million. As the project is currently structured, a majority of the upfront capital costs (all costs associated with development of the plant itself - about 75% of the total cost) would be funded by a private development company. The remaining 25% of estimated project capital costs, which are associated with delivery and distribution of the treated water from the plant, would require funding through some type of program such as State Participation. However, a large state or federal subsidy will be required to make delivered water rates acceptable to end-users. Without this subsidy (estimated at $8 million per year), implementation in the near-term is not feasible.

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Wholesale Water Provider):

BRAZOS RIVER AUTHORITY

Recommended Project/Strategy	***Management Strategy ID#***	***Date Strategy is to be Implemented***	***Capital Cost to be paid by Political Subdivision***
Freeport Desalination Plant	H20-DESAL1	2010	255,699,000
Allens Creek Reservoir	H05-ALLENS	2030	51,012,000
Brazos Saltwater Barrier	H21-BRSWB	2030	30,300,000
Little River Off-Channel Res.	HG03LRIV2	2060	96,512,000
TOTAL COST OF CAPITAL IMPROVEMENTS			$ 433,523,000

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ ***YES*** ☐ ***NO*** (Assumed $51,012,000 shown above is BRA's estimated 1/3 share of total project cost.)

If 'no,' describe how you will meet your future water needs.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_________ Cash Reserves

☐ %__50__ Bonds

☐ %_________ Bank Loans

☐ %_________ Federal Government Programs

☐ %__50__ State Government Programs

☐ %_________ Other____________________

% _________ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

State Participation

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
[signature]	WATER SERVICES MANAGER	254-761-3158

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Wholesale Water Provider):

BRAZOS RIVER AUTHORITY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Freeport Desalination Plant	H20-DESAL1	2010	255,699,000
Allens Creek Reservoir	H05-ALLENS	2030	51,012,000
Brazos Saltwater Barrier	H21-BRSWB	2030	30,300,000
Little River Off-Channel Res.	HG03LRIV2	2060	96,512,000
TOTAL COST OF CAPITAL IMPROVEMENTS			$ 433,523,000

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ % 25 Bonds

☐ %_____ Bank Loans

☐ % 50 Federal Government Programs

☐ %_____ State Government Programs

☐ % 25 Other (Local Partners)

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

David Weeks — Name

WATER SVCS MANAGER — Title

254-761-3158 — Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Wholesale Water Provider):

BRAZOS RIVER AUTHORITY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Freeport Desalination Plant	H20-DESAL1	2010	255,699,000
Allens Creek Reservoir	H05-ALLENS	2030	51,012,000
Brazos Saltwater Barrier	H21-BRSWB	2030	30,300,000
Little River Off-Channel Res.	HG03LRIV2	2050 ~~2060~~	96,512,000
TOTAL COST OF CAPITAL IMPROVEMENTS			$ 433,523,000

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ ***YES*** ☐ ***NO*** (Note that implementation date above was changed to 2050 to be consistent with Initially Prepared Plan.)

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %__50__ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %__50__ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

State Participation

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Dan Meadows	WATER SERVICES MGR	254-761-3158

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

IRRIGATION CHAMBERS

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Irrigation Conservation	H03-IRRCON	2010	212,922
TOTAL COST OF CAPITAL IMPROVEMENTS			$212,922

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ % 50 Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ % 50 State Government Programs

☐ %_____ Other_____

% 100 *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

Agriculture Water Conservation Grants

Agriculture Water Conservation Loans

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Rudge Wilcox	Gen Mgr C.L.C.N.D.	409-267-3541

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

CRYSTAL SPRNGS WATER COMPANY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,220,600
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,220,600

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☒ ***NO***

If 'no,' describe how you will meet your future water needs.

My system ~~is~~ is handled by 2 existing wells with "NO" (or very little) growth anticipated. Each system handles only a small # of customers in "built out" subdivisions!

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Tom C Martin	President	281 354 5136

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

CUT AND SHOOT

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,376,300
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,376,300

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☑ % 10 Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☑ % 90 Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
[signature]	mayor	936-264-3100

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

DAYTON

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,523,500
Purchase surface water Rights			
~~Pipeline~~			
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,523,500

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☑ % 25 Cash Reserves

☑ % 25 Bonds

☐ % _____ Bank Loans

☑ % 25 Federal Government Programs

☑ % 25 State Government Programs

☐ % _____ Other _____

% _____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs. ?

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Brian La Borde | City Planner | 936-258-2642

Name | Title | Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

FORT BEND COUNTY MUD #41

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Allens Creek Reservoir	H05-ALLENS	2030	2,545,907
Expanded Use of GW	H19-EXPGW	2010	416,000
BRA System Operations	HG01BRASYS	2010	11,226,957
TOTAL COST OF CAPITAL IMPROVEMENTS			$14,188,864

pd for out of fees paid to North

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☐ ***NO*** ☒ DO NOT KNOW

If 'no,' describe how you will meet your future water needs.

We are part of the north authority + will pay out of pumpage fees to the NFBRWA. Our population is expected to be ~ 3500, not 25,000.

Please see page 2 for additional information to be provided by the Political subdivision.

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

FORT BEND COUNTY MUD #81

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Allens Creek Reservoir	H05-ALLENS	2030	2,010,106
Expanded Use of GW	H19-EXPGW	2010	416,000
BRA System Operations	HG01BRASYS	2010	725,400
TOTAL COST OF CAPITAL IMPROVEMENTS			$3,151,506

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☒ ***NO***

If 'no,' describe how you will meet your future water needs.

The District plans on expanding the use of ground water at an estimated cost of $2,000,000 to meet the ultimate needs of the District

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

- ☐ %_____ Cash Reserves
- ☐ %_____ Bonds
- ☐ %_____ Bank Loans
- ☐ %_____ Federal Government Programs
- ☐ %_____ State Government Programs
- ☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Kenneth J. Martinez P.E. District Engineer 713-777-5337

Name Title Phone

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☒ %100 Other fees paid to NFBRWA

%100 *TOTAL – (Sum should equal 100%)*

If state government programs are to be ufilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

CINDY ALBERS, PE	DISTRICT ENGINEER	(713) 777-5337
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

FULSHEAR

Recommended Project/Strategy	***Management Strategy ID#***	***Date Strategy is to be Implemented***	***Capital Cost to be paid by Political Subdivision***
BRA System Operations	HG01BRASYS	2010	3,345,545
TOTAL COST OF CAPITAL IMPROVEMENTS			$3,345,545

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☑ ***NO***

If 'no,' describe how you will meet your future water needs.

The required future needs would be meet by receiving federal funding.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Kathy Mayfield	City Secretary	8-2-05
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

GALENA PARK

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	26,329
TOTAL COST OF CAPITAL IMPROVEMENTS			$26,329

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ *YES* ☐ *NO*

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☑ % 50-100 Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

% _____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

John Cooper — Name

City Administrator — Title

713/672-2556 — Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

HARRIS COUNTY WCID #133

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	86,909
New Contracts	H27-NWCUST	2010	2,637,843
TOTAL COST OF CAPITAL IMPROVEMENTS			$2,724,752

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☑ ***NO***

If 'no,' describe how you will meet your future water needs.

See Attachment

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Nathan Adams	Graduate Engineer	(281)350-7027

Supplemental

August 9, 2005

Harris County WCID #133
Survey to obtain infrastructure financing information response

HC WCID 133 (the District) is essentially built out and does not anticipate any annexation, so the current groundwater capacity is sufficient for supplying water for the District system for the foreseeable future. However, the District is under the Harris-Galveston Coastal Subsidence District (HGCSD) mandate to convert to surface water. To that end, the District has elected to participate in the City of Houston Groundwater Reduction Plan. The District is currently evaluating options for connecting to the City of Houston surface water system, including a joint transmission line with other districts in the area. At this time, the District has no scheduled requirement to convert to surface water by the city. As a political subdivision, the District has the ability to finance bonds to pay for capital improvements, however the District plans to utilize any available State or National funding to offset the costs.

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

HEDWIG VILLAGE

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
New Contracts	H27-NWCUST	2010	2,063,989
TOTAL COST OF CAPITAL IMPROVEMENTS			$2,063,989

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ *YES* ☒ *NO*

If 'no,' describe how you will meet your future water needs.

Water needs served by Memorial Villages Water Authority. City of Hedwig Village has no water or wastewater.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

N/A

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Beth Staton (Name) City Admin. (Title) 713/465-6009 (Phone)

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

HUNTSVILLE

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,543,900
12 wells + Infrastructure		2020	$ 40,000,000
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,543,900

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ ***YES*** ☒ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☑ % 100 Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Jason Pierce	Water Superintendent	(806) 294-5762

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

KATY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	980,231
Lake Houston Additional Yield	H15-HOUYLD	2010	29,576,495
TOTAL COST OF CAPITAL IMPROVEMENTS			$30,556,726

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

The City of Katy is under the West Harris County Regional Water Authority.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL -- (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

_____ _____ _____

Name Title Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

LAKE JACKSON

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,393,500
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,393,500

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☒ ***NO***

If 'no,' describe how you will meet your future water needs.

This project is not needed as the City of Lake Jackson already has infrastructure in place to produce more groundwater than called for in the plan. We will be providing written comments on the plan to have our actual groundwater capability recognized in the plan.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Craig Nitsch	Public Works Director	(979) 415-2430

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group ___Region H Water Planning Group_____

Political Subdivision (Water User Group):

LAKE LIVINGSTON WATER SUPPLY & SEWER SERVICE COMPANY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,842,400
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,842,400

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

At the present time LLWS&SSC has a loan application with the Texas Drinking Water State Revolving Fund for $7,895,000.00. Also LLWS&SSC has additional water systems not covered by Region H.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

John Garzer	Financial Officer	7/11/05
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group ___Region H Water Planning Group_____

Political Subdivision (Water User Group):

LIBERTY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	416,000
TOTAL COST OF CAPITAL IMPROVEMENTS			$416,000

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

WE ARE ALSO EXPLORING COST EFFECTIVENESS OF SURFACE H2O

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☒ % TBD Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☒ % TBD State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.
SRF CERTIFICATES - COBG -

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
[signature]	City Mgr	936 336 8188

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group ___Region H Water Planning Group_____

Political Subdivision (Water User Group):

LONGHORN TOWN UD

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	209,234
Expanded Use of GW	H19-EXPGW	2010	5,952,444
TOTAL COST OF CAPITAL IMPROVEMENTS			$6,161,678

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☑ ***NO***

If 'no,' describe how you will meet your future water needs.

Longhorn Town UD has entered into a GRP with the City of Houston. Additionally, the existing water plant is sufficient to serve existing and projected development within the DISTRICT.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☑ % 100 Other Rate Structure as defined in GRP.

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
GREG LENTZ, P.E.	PROJ. MANAGER	713-461-9600

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

MADISONVILLE

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	416,000
TOTAL COST OF CAPITAL IMPROVEMENTS			$416,000

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☐ ***NO*** —

If 'no,' describe how you will meet your future water needs.

Without more time, frankly I don't even know where you came up with the $416,000 -

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Tom Hunt	City Manager	936-348-2748

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH NEEDS

Regional Water Planning Group Region H Water Planning Group
Political Subdivision (WUG or WWP) Montgomery County MUD No. 8

Recommended Project/Strategy	***Implementa-tion Date***	***Capital Cost to be paid by Political Subdivision***	***ID# from DBO7***
Expanded Use of GW	H19-EXPGW	2010	416,000
New Contracts	H27-NWCUST	2020	8,041,900
TOTAL COST OF CAPITAL IMPROVEMENTS		$8,457,900	

Are you planning to implement the recommended projects/strategies?
• ***•YES**** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

* The District will comply with recommended compliance requirements, but do not anticipate such compliance will require the District to obtain surface water as other means of compliance would be utilized, such as paying pumpage fees, etc.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

- %5_____ Cash Reserves
- %_____ Bonds
- %_____ Bank Loans
- %_____ Federal Government Programs
- %5_____ State Government Programs
- %_____ Other_____

%100_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

Drinking Water State Revolving Fund, if qualify, otherwise stated water loan programs_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Ross J. Radcliffe	Attorney for MCMUD 8	713.237.1221
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group ___Region H Water Planning Group_____

Political Subdivision (Water User Group):

MONTGOMERY COUNTY MUD #9

	Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
1Y	Expanded Use of GW	H19-EXPGW	2010	1,381,000
2X	New Contracts	H27-NWCUST	2020	9,026,500
	TOTAL COST OF CAPITAL IMPROVEMENTS			$10,407,500

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

[1]MUD 9 has budgeted funds for the construction of a new water well.
[2]While the District anticipates the development of a regional approach to the conversion from ground water to surface water in which the District will participate, the District does not foresee converting to surface water given its location. As a reulst, the District does not anticipate capital expenses related to the conversion to surface water at this time.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group?

Please indicate:

1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☒ % 13† Cash Reserves

☐ %______ Bonds

☐ %______ Bank Loans

☐ %______ Federal Government Programs

☒ % 87* State Government Programs

☐ %______ Other______

% ______ *TOTAL – (Sum should equal 100%)*

†[The District has escrowed bond funds on hand for the construction of an additional waterwell. This covers 100% of the projected cost of the waterwell, which is approximately 13% of the total cost of capital improvements identified on page 1 of this survey.]

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

*If the District has capital costs associated with a conversion to surface water, it will likely seek funding through the Water and Wastewater Loan Program or the State Drinking Water Revolving Fund.

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Jonathan K. Frels	Attorney	713.758.4754
Name	Title	Phone

Vinson&Elkins

Facsimile

[illegible]
[illegible]

From:	Date:	
Jonathan K. [illegible]	[illegible]	
Regarding:	**Number of Pages:**	**Hard Copy Follows:**
[illegible]	2	No
To:	**Fax:**	**Phone:**
Region [illegible] Water Planning Group Ekistics Corporation	713.520.8150	

Message:

Vinson & Elkins LLP Attorneys at Law Austin Beijing Dallas Dubai Houston London Moscow New York Tokyo Washington

First City Tower, 1001 Fannin Street, Suite 2500, Houston, TX 77002-6760
Tel 713.758.2222 Fax 713.758.2346 www.velaw.com

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

MONTGOMERY COUNTY UD #2

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
New Contracts	H27-NWCUST	2020	2,647,400
TOTAL COST OF CAPITAL IMPROVEMENTS			$2,647,400

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ YES ☑ NO

If no, describe how you will meet your future water needs.

See Supplemental attached

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %________ Cash Reserves

☐ %________ Bonds

☐ %________ Bank Loans

☐ %________ Federal Government Programs

☐ %________ State Government Programs

☐ %________ Other________________

%________ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

____

____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Nathan Adams	Graduate Engineer	(281) 350-7027
Name	Title	Phone

Supplemental

July 28, 2005

Montgomery County UD No. 2
Survey to obtain infrastructure financing information response

The District is currently under Lone Star Groundwater Conservation District jurisdiction for surface water compliance. To date, Lone Star has not adopted a plan for transferring to surface water, so the District does not have conversion amount information or deadlines. The infrastructure for surface water conversion for this area is proposed to be designed and installed under the direction of the San Jacinto River Authority (SJRA). Until a conversion plan is adopted, the SJRA cannot finalize an infrastructure plan, so the District does not know the extent of financial participation that will be required to connect to the future surface water system. Therefore, the District is unable to completely answer this survey, at this time.

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

NORTH HARRIS COUNTY REGIONAL WATER AUTHORITY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	11,424,922
New Contracts	H27-NWCUST	2020	1,007,394,970
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,018,819,892

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

■ *YES* □ *NO*

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☑ %__100__ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%__100__ TOTAL – (Sum should equal 100%)

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Jimmie Schindewolf, P.E.	General Manager	281-440-3924
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

NORTH MISSION GLEN MUD "district"

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Allens Creek Reservoir	H05-ALLENS	2030	2,810,395
Expanded Use of GW	H19-EXPGW	2010	416,000
BRA System Operations	HG01BRASYS	2010	11,514,487
TOTAL COST OF CAPITAL IMPROVEMENTS			$14,740,882

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☒ ***NO***

If 'no,' describe how you will meet your future water needs.

The district has constructed facilities adequate to supply water to the service area. The district also plans to join a ground water reduction plan within the time frame specified by the Fort Bend Subsidence District 2003 Regulatory Plan.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Robert Wempe, P.E.	Project Director Turner Collie & Braden	(713) 267-3189

CITY OF PANORAMA VILLAGE, TEXAS

MAILING ADDRESS:
99 HIWON Dr., PANORAMA VILLAGE, TEXAS 77304-1123
(936) 856-2821
(936) 856-2751
FAX (936)856-2547

August 16, 2005

Region H Water Planning Group
c/o Glenda Calloway, Principal
Ekistics Corporation
2727 Kirby Drive, Suite 523
Houston, Texas 77098

Subject: SB2 Projected Population Growth &
Regional Water Planning Water Demand Projections for Region H
User Group: Panorama Village

Dear Glenda Calloway:

A RECENT "SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS" which we have responded to, but it has got us to reviewing this entire subject. I ask you to read our attached response to the survey.

In reviewing previous correspondence, we have several concerns as follows:

1. We attach Jim Adams September 9, 2002 letter to Howard Kravetz and Mark V. Lowery, P.E., letter dated September 19, 2002 with corrections. Letters establish population projections by decade beginning 2010 to 2060. At the time these projections seemed high, about twice what we would have projected based on building lots available; however, we did not take issue with the projections at that time as they did not seem relevant.
2. When we received the above survey with a Capitol Cost to be paid by Political Subdivisions in the amount of $3,062,500 it got our attention.
3. We, Panorama Village, feel that Region H Water Planning Group needs to correct both the population projections and the WUG Annual Water Demand (acre-feet/year) projections.
4. Since many of us won't be around in the decades ahead, we feel that the projections on record should be as accurate as possible.

We are attaching a work sheet of how we came to our conclusions. We may have minor differences of opinion, but we would hope that the Planning Group would accept our recommendations in the spirit that they are offered. We also recognize that the Planning Groups probably have a standardized approach at projecting growth and demand and does not make adjustments for special situations such as limited growth and demand constraints.

Respectfully,

Dale E. Evans
Council Position No. 2

DEE:bmc

Copies to: Ms. Connie Townsend
Turner Collie & Braden Inc.
400 West 15th Street, Suite 500
Austin, Texas 78701

Kathy Jones, General Manager
Lone Star Conservation District
207 W. Philips, Suite 300
Conroe, TX 77301

Howard Kravetz, Mayor
City Council
John Demel

8-10-05

PROFILE OF GENERAL DEMOGRAPHIC CHARACTERISTICS:

		Year 2000
Total Population		1965
Occupied housing units		877
Vacant housing units		46
Total housing units		923
Average household size		2.24
ADJUSTMENTS		
Population increase if vacant housing units become occupied:	46 x 2.24=	103
Housing units built or under construction since 12/31/00		109
Population of new housing units completed since 12/31/00 as of 7/15/05		244
Projected population when all available units are occupied:	1965 + 103 + 244=	2312
Housing units added if all available lots are built out		300
Total housing units when built out:	923 + 109 + 300=	1332
Projected population when built-out	1332 x 2.24 =	2984

Water demand at build-out or D2060 = (population) x (daily per capita water-use rate) x (365 days/year) x (1 ac-ft/325,851 gallons)
2984 x 262 x 365 x 1/ 325,851 = 876 ac-ft

WUG Annual Water Demand (acre-feet/year) = 876ac-ft

Note 1. The 876 projection compares to Current SB2 TWDB Draft Projections of 1148 WUG Annual Water Demand

Note 2 Our projected population when completely built-out of 2984 compares to SB2@ D2020 of 2888 which tells us that we will have little or no growth after 2029, and if we do, it will result from shortfall prior to D2020. SB2 projection at 2060 is 6635 compared to our projection at build out of 2984.

Kellogg Brown & Root, Inc.

JOINT VENTURE

Turner Collie & Braden Inc.

Mark V. Lowry

Connie Townsend

September 19, 2002

Turner Collie & Braden Inc.
Engineers • Planners • Project Managers

400 West 15th Street
Suite 500
Austin, Texas 78701

The Honorable Howard Kravetz
Mayor of Panorama Village
99 Hiwon Dr.
Panorama Village, TX 77304-1123

Re: **Notification of New Population Projections**
Correction of Data Table

Dear Mayor Kravetz:

You recently received a letter from Jim Adams, Chairman of the Region H Regional Water Planning Group, containing population information for your City or County. The data contained in the letter was extracted from much larger tables to make it more manageable to send and for you to read. However, when the data was extracted, the table headings did not print correctly, and the first column is labeled Year 2000 for both the SB1 data and the new TWDB projections for the 2007 state water plan. The first column for each dataset should have been labeled Year 1990 and the remaining columns renumbered by decade. These tables were prepared by Turner Collie and Braden Inc. for the Regional Planning Group, and this was our oversight.

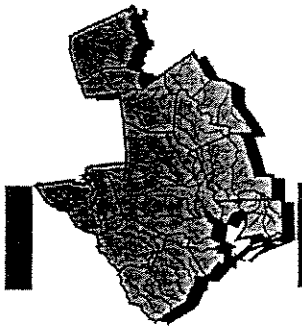
We are enclosing a copy of a single page of the main data table that contains the population comparisons for your entity, and also allows you to see the population comparisons of other entities near you. We apologize for any inconvenience this has caused, and please contact me at 512/457-7736, or by email at mark.lowry@tcb.aecom.com if you have any questions about the population projections or the methodology used by the Texas Water Development Board in preparing them.

Cordially,

Mark V. Lowry

Mark V. Lowry, P.E.

Attachment



Region H
Water Planning Group

September 9, 2002

Howard Kravetz
Panorama Village
City Mayor
99 Hiwon Dr.
Panorama Village, TX 77304

Dear Howard Kravetz,

The Region H Regional Water Planning Group is in the process of developing the 2006 Region H Water Plan for the Texas Water Development Board (TWDB). This regional water plan will be combined with the other 15 regional plans developed in Texas to form the 2006 State Water Plan, which will be adopted in January 2007.

One of the first and crucial components of preparing the updated State Water Plan is the development of population projections for the area. *Panorama Village* was identified as a Water User Group (WUG) in Region H, by the TWDB, for the 2002 State Water Plan. *Panorama Village* has also been identified as a WUG by the TWDB for the 2006 State Water Plan. A WUG is defined by the TWDB as a city with population greater than 500, an individual utility providing more than 280 acre-feet per year (0.25 mgd), the rural and suburban unincorporated portions of each county ("county-other"), and county-wide non-municipal use categories including manufacturing, electric power generation, mining, irrigation, and livestock.

The TWDB has recently prepared updated Draft population projections, based on U.S. Census Year 2000 data, for all water user groups in Texas. Upon approval by the regional water planning groups (RWPGs), these new population projections will become the backbone for water demand and supply planning for the 2007 State Water Plan. *Tables 1* and *2*, provided below, summarize the Draft population projections developed for *Panorama Village*. *Table 1* provides a comparison of the projected Year 2000 population developed for the 2002 State Water Plan to *Panorama Village's* actual 2000 census population data. *Table 2* provides a comparison of *Panorama Village's* decadal population projections through the year 2050 for the 2002 vs. the Draft 2006 State Water Plan.

Region H is requesting that you review the Draft population projections provided in *Tables 1* and *2* for *Panorama Village* and provide comment to the Region H RWPG no later than September 24, 2002. It is the intent of the TWDB to approve and finalize all regional population projections at their February 2003 board meeting. It is imperative that any comments and/or issues with these projections be received by the RWPG as soon as possible so they can be presented to and addressed by the TWDB early in their finalization/approval process.

The TWDB's guidelines establishing the mechanism for requesting revisions to the Draft TWDB population projections are also attached to this letter for your convenience. Formal requests for revisions must go through the Region H Planning Group to the TWDB. However, Region H does not have the funding available to investigate the accuracy of population projections for each WUG nor to develop the data required to justify possible revisions based on the TWDB published guidelines. Therefore this data must be developed by the individual WUG and/or the WUG's consultant. Region H will review the data developed and submit the request to the TWDB for their consideration.

Please send comments to:

Mark V. Lowry, P.E.
Associate Vice President
Turner Collie & Braden Inc.
400 W. 15th Street, Suite 500
Austin, Texas 78701

or

mark.lowry@tcb.aecom.com

We appreciate your attention to this matter and look forward to hearing from you. If you have any questions or need further information, please feel free to call Mark Lowry at 512-457-7736.

Sincerely,

Jim Adams

Jim Adams, P.E.
Region H Chairman

Table DP-1. Profile of General Demographic Characteristics: 2000

Geographic Area: Panorama Village city, Texas

[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent
Total population	1,965	100.0
SEX AND AGE		
Male	908	46.2
Female	1,057	53.8
Under 5 years	79	4.0
5 to 9 years	87	4.4
10 to 14 years	109	5.5
15 to 19 years	105	5.3
20 to 24 years	62	3.2
25 to 34 years	126	6.4
35 to 44 years	247	12.6
45 to 54 years	317	16.1
55 to 59 years	142	7.2
60 to 64 years	119	6.1
65 to 74 years	274	13.9
75 to 84 years	251	12.8
85 years and over	47	2.4
Median age (years)	50.5	(X)
18 years and over	1,617	82.3
Male	735	37.4
Female	882	44.9
21 years and over	1,568	79.8
62 years and over	644	32.8
65 years and over	572	29.1
Male	243	12.4
Female	329	16.7
RACE		
One race	1,944	98.9
White	1,912	97.3
Black or African American	12	0.6
American Indian and Alaska Native	3	0.2
Asian	6	0.3
Asian Indian	-	-
Chinese	1	0.1
Filipino	2	0.1
Japanese	-	-
Korean	-	-
Vietnamese	-	-
Other Asian [1]	3	0.2
Native Hawaiian and Other Pacific Islander	-	-
Native Hawaiian	-	-
Guamanian or Chamorro	-	-
Samoan	-	-
Other Pacific Islander [2]	-	-
Some other race	11	0.6
Two or more races	21	1.1
Race alone or in combination with one or more other races: [3]		
White	1,927	98.1
Black or African American	19	1.0
American Indian and Alaska Native	16	0.8
Asian	7	0.4
Native Hawaiian and Other Pacific Islander	-	-
Some other race	24	1.2

Subject	Number	Percent
HISPANIC OR LATINO AND RACE		
Total population	1,965	100.0
Hispanic or Latino (of any race)	52	2.6
Mexican	44	2.2
Puerto Rican	2	0.1
Cuban	1	0.1
Other Hispanic or Latino	5	0.3
Not Hispanic or Latino	1,913	97.4
White alone	1,877	95.5
RELATIONSHIP		
Total population	1,965	100.0
In households	1,965	100.0
Householder	877	44.6
Spouse	572	29.1
Child	424	21.6
Own child under 18 years	321	16.3
Other relatives	58	3.0
Under 18 years	22	1.1
Nonrelatives	34	1.7
Unmarried partner	16	0.8
In group quarters	-	-
Institutionalized population	-	-
Noninstitutionalized population	-	-
HOUSEHOLD BY TYPE		
Total households	877	100.0
Family households (families)	654	74.6
With own children under 18 years	181	20.6
Married-couple family	572	65.2
With own children under 18 years	147	16.8
Female householder, no husband present	62	7.1
With own children under 18 years	24	2.7
Nonfamily households	223	25.4
Householder living alone	210	23.9
Householder 65 years and over	132	15.1
Households with individuals under 18 years	198	22.6
Households with individuals 65 years and over	384	43.8
Average household size	2.24	(X)
Average family size	2.61	(X)
HOUSING OCCUPANCY		
Total housing units	923	100.0
Occupied housing units	877	95.0
Vacant housing units	46	5.0
For seasonal, recreational, or occasional use	11	1.2
Homeowner vacancy rate (percent)	1.5	(X)
Rental vacancy rate (percent)	9.8	(X)
HOUSING TENURE		
Occupied housing units	877	100.0
Owner-occupied housing units	794	90.5
Renter-occupied housing units	83	9.5
Average household size of owner-occupied units	2.26	(X)
Average household size of renter-occupied units	2.10	(X)

- Represents zero or rounds to zero. (X) Not applicable.

[1] Other Asian alone, or two or more Asian categories.

[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.

[3] In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000.

SB1 — Senate Bill 1

Final_Old_Compare

SB2 — Senate Bill 2

County Name	WUG Name	Population Projection Scenario	1990	2000	2010	2020	2030	2040	2050	2060
MONTGOMERY	PANORMA VILLAGE	New SB2 Projections	1,556	1,965	2,538	2,888	3,572	4,367	5,415	6,633
		Previous SB1 Projections	1,556	2,149	2,812	3,599	4,490	5,437	6,583	-
MONTGOMERY	PATTON VILLAGE	New SB2 Projections	1,155	1,391	1,721	1,923	2,318	2,777	3,382	4,085
		Previous SB1 Projections	1,155	1,584	2,309	3,142	3,984	4,639	5,450	-
MONTGOMERY	ROMAN FOREST	New SB2 Projections	1,033	1,279	1,623	1,833	2,244	2,722	3,353	4,085
		Previous SB1 Projections	1,033	1,464	1,673	1,954	2,277	2,650	3,084	-
MONTGOMERY	SHENANDOAH	New SB2 Projections	1,718	1,503	1,503	1,503	1,503	1,503	1,503	1,503
		Previous SB1 Projections	1,718	2,448	3,547	4,826	6,064	7,128	8,378	-
MONTGOMERY	SPLENDORA	New SB2 Projections	745	1,275	2,017	2,470	3,356	4,386	5,745	7,323
		Previous SB1 Projections	745	1,033	1,138	1,385	1,675	1,994	2,257	-
MONTGOMERY	THE WOODLANDS (CRU/CDP)	New SB2 Projections	29,205	55,649	60,080	111,470	119,300	119,300	119,300	119,300
		Previous SB1 Projections	29,205	60,080	111,470	119,300	119,300	119,300	119,300	-
MONTGOMERY	WILLIS	New SB2 Projections	2,764	3,985	5,695	6,739	8,780	11,153	14,283	17,918
		Previous SB1 Projections	2,764	4,283	5,397	7,096	8,913	10,475	12,310	-
POLK	LIVINGSTON	New SB2 Projections	5,019	5,433	5,609	5,784	5,922	6,029	6,144	6,254
		Previous SB1 Projections	5,019	7,864	8,779	9,881	11,125	12,095	12,969	-
POLK	ONALASKA	New SB2 Projections	728	1,174	1,363	1,552	1,701	1,817	1,941	2,059
		Previous SB1 Projections	728	1,057	1,204	1,438	1,649	1,861	1,978	-
SAN JACINTO	SHEPHERD	New SB2 Projections	1,812	2,029	2,221	2,409	2,560	2,654	2,708	2,733
		Previous SB1 Projections	1,812	2,452	2,728	2,842	2,893	3,071	3,258	-
TRINITY	GROVETON	New SB2 Projections	751	565	630	680	696	688	660	635
		Previous SB1 Projections	751	840	879	908	940	983	1,046	-
TRINITY	TRINITY	New SB2 Projections	2,648	2,721	3,033	3,273	3,352	3,311	3,180	3,060
		Previous SB1 Projections	2,648	2,947	3,085	3,189	3,299	3,452	3,673	-
WALKER	NEW WAVERLY	New SB2 Projections	936	950	1,087	1,199	1,252	1,239	1,242	1,242
		Previous SB1 Projections	936	1,104	1,145	1,165	1,229	1,292	1,392	-
WALLER	BROOKSHIRE	New SB2 Projections	2,922	3,450	3,930	4,499	5,133	5,838	6,678	7,642
		Previous SB1 Projections	2,922	4,230	5,994	7,680	9,538	11,273	13,323	-
WALLER	HEMPSTEAD	New SB2 Projections	3,556	4,691	5,724	6,947	8,309	9,825	11,630	13,703
		Previous SB1 Projections	3,556	4,327	5,032	5,712	6,290	7,159	8,149	-
WALLER	PINE ISLAND	New SB2 Projections	571	849	1,102	1,402	1,736	2,107	2,549	3,057
		Previous SB1 Projections	571	731	748	751	780	819	858	-
AUSTIN	COUNTY-OTHER	New SB2 Projections	10,294	12,508	14,619	16,623	18,020	18,850	19,248	19,794
		Previous SB1 Projections	10,294	11,495	12,782	14,282	15,781	17,361	19,604	-
BRAZORIA	BAILEY'S PRAIRIE	New SB2 Projections	634	694	744	795	844	889	938	988
		Previous SB1 Projections	634	739	762	773	816	862	908	-
BRAZORIA	BRAZORIA	New SB2 Projections	2,717	2,787	2,845	2,906	2,964	3,017	3,074	3,133
		Previous SB1 Projections	2,717	3,276	3,945	4,619	5,461	5,829	6,222	-
BRAZORIA	FREEPORT	New SB2 Projections	11,389	12,708	15,794	19,006	22,082	24,917	27,922	31,059
		Previous SB1 Projections	11,389	14,344	15,374	16,696	18,796	20,062	21,413	-
BRAZORIA	LAKE JACKSON	New SB2 Projections	22,771	26,386	29,383	32,502	35,488	38,241	41,159	44,205
		Previous SB1 Projections	22,771	27,171	32,034	37,429	44,287	50,046	56,555	-
BRAZORIA	WEST COLUMBIA	New SB2 Projections	4,372	4,255	4,158	4,057	3,960	3,871	3,777	3,678
		Previous SB1 Projections	4,372	5,482	6,035	6,720	7,671	8,363	9,118	-

Water User Group (WUG): *Panorama Village*
County: *MONTGOMERY*

Senate Bill 2

Current SB2 TWDB Draft Projections

Texas Water Development Board

WUG Daily Per Capita Water-Use Rates (gallons per person per day)

R2000	R2010	R2020	R2030	R2040	R2050	R2060
275	270	267	264	263	262	262

275 x 1965 pop. x 365 = 197,236,875 / yr.

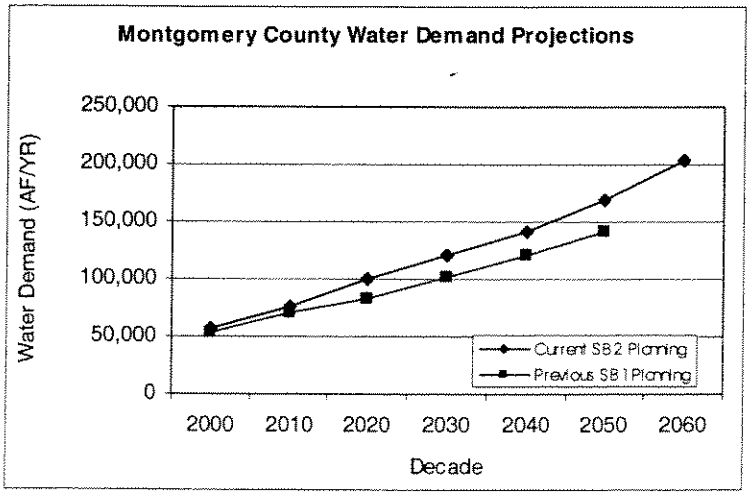
WUG Annual Water Demands (acre-feet/year)

D2000	D2010	D2020	D2030	D2040	D2050	D2060
605	768	864	1056	1153	1148	1148

Water Demand = (population)*(daily per capita water-use rate)*(365 days/yr)*(1ac-ft / 325,851 gallons)

$$1965 \times 275 \times 365 \times \frac{1}{325,851} = 605.298$$

County Water Demands Comparison Graph



1 acre = 43,560 SQ. FT.

acre-feet = 43,560 SQ. FT. x 1 ft = 43560

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

PANORAMA VILLAGE

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
New Contracts	H27-NWCUST	2020	3,062,500
TOTAL COST OF CAPITAL IMPROVEMENTS			$3,062,500

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ *YES* ☒ *NO*

If 'no,' describe how you will meet your future water needs.

The City of Panorama Village is near build out with approximately 300 lots available for additional population growth. Current capacity of the City's well system is 2.8 million gallons/day. During the month of June, our maximum daily pumping never exceeded 40% of our capacity, even though this was the driest and hottest June on record. If Panorama Village does completely build out the remaining lots, it is anticipated that the City's existing supply will be sufficient to meet these growth needs. As always, the City intends to continue promoting "water conservation" in Panorama Village as stewards of our most precious natural resource.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Dale E. Evans — Name Dale E. Evans

Council Position No. 2 — Title

(936) 856-2821 — Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

PEARLAND

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Allens Creek Reservoir	H05-ALLENS	2030	6,825,489
TRA-Houston	H10-TRAXFR	2020	17,326,868
Expanded Use of GW	H19-EXPGW	2020	3,066,600
TOTAL COST OF CAPITAL IMPROVEMENTS			$27,218,957

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ *YES* ☐ *NO*

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☒ %100 Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Bill Eisen	City Manager	281-652-1663
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

PINEY POINT VILLAGE

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	58,250
New Contracts	H27-NWCUST	2010	2,983,194
TOTAL COST OF CAPITAL IMPROVEMENTS			$3,041,444

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ *YES* ☑ *NO*

If 'no,' describe how you will meet your future water needs.

Piney Point Village owns no water facilities. Our residents are served by Memorial Villages Water Authority, A seperate Governmental Agency.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Mike Montgomery	General Manager	713·465·8318
Name	Title	Phone

Memorial Villages Water Authority

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

RICHMOND

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Allens Creek Reservoir	H05-ALLENS	2030	1,235,413
BRA System Operations	HG01BRASYS	2010	8,714,319
TOTAL COST OF CAPITAL IMPROVEMENTS			$9,949,732

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☒ ***NO***

If 'no,' describe how you will meet your future water needs.

The BRA is working with stakeholders to locate a surface water treatment plant in our area.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
R. Gilmore	City Mgr	281-342-5456

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

RIVER PLANTATION MUD

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
New Contracts	H27-NWCUST	2010	3,830,500
TOTAL COST OF CAPITAL IMPROVEMENTS			$3,830,500

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ *YES* ☒ *NO*

If 'no,' describe how you will meet your future water needs.

The district is built out and has no room to expand. Population has not increased since 2000. Please flat line any projected growth for the future.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
Richard Ramirez	District Manager	936/273-4641

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

RIVERSIDE WSC

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	398,600
TOTAL COST OF CAPITAL IMPROVEMENTS			$398,600

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

We will need more than 398,600 just in install the Elevated storage tank needed. Our customer accounts have increased 400 in the last 3 years. We are drilling new wells.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_40_ Bank Loans

☐ %_____ Federal Government Programs

☐ %_50_ State Government Programs

☐ %_10_ Other_raise water rates_

%_100_ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.
TDCHA - Local grants we would like to see funding be made avalible at local levels - One RWSC gets all grants Every year.

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

DAVID Weinkauf	General Manager	936-594-5793
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

ROSENBERG

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Allens Creek Reservoir	H05-ALLENS	2030	3,849,575
BRA System Operations	HG01BRASYS	2010	19,563,566
TOTAL COST OF CAPITAL IMPROVEMENTS			$23,413,141

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

City is a stakeholer with BRA, City of Richmond, Pecan Grove MUD, New Territory MUDs, and Greatwood MUDs in the preparation of a feasibility study for a Regional Surface Water Plant in this area. The study will also look at apporiate conversion credit options. This study will better define a strategy and this information can be provided to Region H. The projected completion date of the study is October 2005.

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☒ % 75 Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☒ % 25 State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.
Drinking Water State Revolving Fund Loan Program, State Participation in Regional Water and Wastewater Facilities Program, and Water and Wastewater Loan Program

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Cathy Ezell	Finance Manager	(832)595-3350
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group ___Region H Water Planning Group_____

Political Subdivision (Water User Group):

SEALY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
Expanded Use of GW	H19-EXPGW	2010	1,361,800
TOTAL COST OF CAPITAL IMPROVEMENTS			$1,361,800

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☑ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☑ % 20 Cash Reserves

☑ % 80 Bonds

☐ % _____ Bank Loans

☐ % _____ Federal Government Programs

☐ % _____ State Government Programs

☐ % _____ Other _____

% 100 *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

John Maresh	City Manager	979-885-3511
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

TOMBALL

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	1,298,975
Lake Houston Additional Yield	H15-HOUYLD	2010	23,278,511
TOTAL COST OF CAPITAL IMPROVEMENTS			$24,577,486

The following information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ *YES* ☐ *NO*

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☒ % 100 Other North Harris County Regional Water Auth.

% 100 *TOTAL -- (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Roderick J. Hainey	Director of Public Work	281-290-1415
Name	Title	Phone

Subj: **C:\Sharpdesk Desktop\IMAGE (23).PDF;**
Date: 7/18/2005 5:21:22 PM Central Standard Time
From: rhainey@ci.tomball.tx.us
To: glencall@aol.com

Glenda,

Attached are the survey results for the Region "H" Water Planning Group.

Thanks

Roderick Hainey
Director of Public Works
City of Tomball
281-290-1415 (o)
C:\Sharpdesk Desktop\IMAGE (23).PDF;
<<IMAGE (23).PDF>>

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group ___Region H Water Planning Group_____

Political Subdivision (Water User Group):

TRAIL OF THE LAKES MUD

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2020	246,281
Expanded Use of GW	H19-EXPGW	2010	546,000
New Contracts	H27-NWCUST	2010	5,167,525
TOTAL COST OF CAPITAL IMPROVEMENTS			$5,959,806

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☐ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %_____ Cash Reserves

☐ %_____ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

%_____ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
_____	_____	_____

Vinson&Elkins

Memorandum

Marilyn Roberts mroberts@velaw.com
Tel 713.758.2852 **Fax** 713.615.5107

Date: August 5, 2005

To: Region H Water Planning Group
c/o Ekistics Corporation
2727 Kirby Drive, Suite 523
Houston, TX 77098

From: Marilyn Roberts

Re: Trail of the Lakes MUD (the "District")

I am returning herewith your correspondence regarding updates to the Region H Water Planning Group Regional Water Plan. Please be advised that the captioned District is in the West Harris County Regional Water Authority and **not** the Region H Water Planning Group.

I would appreciate your removing the District's name from your mailing list.

Thank you.

MAR

Enclosure

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

WEST HARRIS COUNTY REGIONAL WATER AUTHORITY

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
TRA-Houston	H10-TRAXFR	2030	711,815
TRA-Houston	H10-TRAXFR	2030	7,601,392
TOTAL COST OF CAPITAL IMPROVEMENTS			$711,815

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ ***YES*** ☐ ***NO***

If 'no,' describe how you will meet your future water needs.

_____

_____

_____

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☒ %__1__ Cash Reserves

☒ %__99__ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

☐ %_____ Other_____

% 100 *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.
IF PLANS CHANGE IN THE FUTURE WHCRWA RESERVES THE RIGHT TO USE SRF/TWDB PROGRAMS

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

WAYNE G. AHRENS	ENGINEER	713-527-6378
Name	Title	Phone

SURVEY TO OBTAIN INFRASTRUCTURE FINANCING INFORMATION FROM POLITICAL SUBDIVISIONS WITH WATER NEEDS

Regional Water Planning Group Region H Water Planning Group

Political Subdivision (Water User Group):

WILLIS

Recommended Project/Strategy	*Management Strategy ID#*	*Date Strategy is to be Implemented*	*Capital Cost to be paid by Political Subdivision*
New Contracts	H27-NWCUST	2020	3,914,600
TOTAL COST OF CAPITAL IMPROVEMENTS			$3,914,600

The following Information is to be provided by the Political Subdivision.

Are you planning to implement the recommended projects/strategies?

☒ ***YES*** ☐ ***NO*** IF NECESSARY.

If 'no,' describe how you will meet your future water needs.

CONTRACT W/ SJRA VIA CITY OF CONROE

Please see page 2 for additional information to be provided by the Political subdivision.

If 'yes', how do you plan to finance the proposed <u>total cost of capital improvements</u> identified by your Regional Water Planning Group?

Please indicate:
1) Funding source(s)[1] by checking the corresponding box(es) and

2) Percent share of the total cost to be met by each funding source.

☐ %__10__ Cash Reserves

☐ %__90__ Bonds

☐ %_____ Bank Loans

☐ %_____ Federal Government Programs

☐ %_____ State Government Programs

} IF AVAILABLE

☐ %_____ Other_____

%__100__ *TOTAL – (Sum should equal 100%)*

If state government programs are to be utilized for funding, indicate the programs and the provisions of those programs.

_____

_____

[1]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Person Completing this Form:

Name	Title	Phone
J. McALISTER	ADMIN	936-856-4611

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APPENDICES

10. Public Participation in Developing the 2006 Region H Water Plan

10.1 Introduction

The Region H Water Planning Group (RHWPG) has sought to encourage public involvement and the participation of interested parties during the process of plan development so that any concerns could be addressed before the draft plan was completed. From its initial deliberations in preparing the 2001 Regional Water Plan, the RHWPG has made a commitment to an open planning process and has actively solicited public input and involvement in developing the elements of the 2006 Regional Water Plan (RWP). Securing a high level of public participation continues to be a challenge for long-term planning, even for a topic so vital to public well-being as the water supply, particularly if there is no drought. The attention of the news media in a major media market is rarely focused on continuing efforts that result in lengthy documents, no matter how important those documents may be to the region's future. Nevertheless, the RHWPG has reached out to communicate with the general public and especially with those segments of the population who will be most affected by the results of the regional water plan. This has been accomplished by pursuing several avenues to gain public involvement.

10.1.1 Regional Water Planning Group as Stakeholder Representatives

The first line of public involvement occurs through the membership of the Region H Water Planning Group. Each of the members of the RHWPG represent an interest category, such as river authority, agriculture, small businesses, general public, etc. They also represent the different geographic areas within this large region. Most of these members have organizational linkages to the community. These linkages, such as professional organizations or citizens groups, are the first avenue for taking information to the public and for receiving input to the RHWPG.

During development of the 2006 RWP, the RHWPG has met on the first Wednesday of the month at least quarterly, but often on a more frequent basis, so that interested parties can plan to attend and follow the proceedings. Notices of these meetings are posted in each of the counties in Region H and are e-mailed to a list of "interested persons" who have requested to be informed. The RHWPG maintains minutes of its meetings and places them on the Texas Water Development Board Internet website.

10.1.2 Public Meetings during Plan Development

In addition to the January 2002 public hearing initiating the planning effort, the Region H Water Planning Group has held public meetings/hearings at several points in the planning process. Because of the poor attendance at some of these meetings, a variety of locations and times were scheduled in an attempt to determine the most advantageous. Most of the meetings were held in the evening at accessible sites in the region. Meeting formats encouraged discussion of the issues and in spite of the sparse turnout, those attending generally gave positive feedback. Summaries of the meetings and lists of attendees are included in this report.

In December 2002, meetings were held in Houston at the City of Houston's E. B. Cape Training Center, and in Conroe at the Montgomery County Memorial Library. These were both evening meetings and focused on review and comment on the draft population

projections prepared by the Texas Water Development Board for use in preparing the regional water plan.

In March 2003, meetings were held in at four locations: in Conroe at the SJRA offices in conjunction with a Region H Water Planning Group meeting; in Houston at San Jacinto College-South; in the Greenway Plaza area at the Houston-Galveston Area Council; and at the Walker County Courthouse in Huntsville. The purpose of this series of meetings was to present the draft water demand projections to be used in planning for Region H and to receive comments and requests for corrections or changes to the projections from attendees.

On October 6, 2004, a public hearing was held on a proposed amendment to the 2001 Region H Water Plan. It was subsequently determined that additional time for comment was required before the RHWPG could adopt the amendment. The period for written comments was extended to January 4, 2005 and a public hearing and decision rescheduled for the RHWPG meeting on January 5, 2005. Both of these hearings were morning meetings and occurred in conjunction with regularly scheduled RHWPG meetings.

Public hearings are planned for July 12 and 14, 2005 to receive comments on the Initially Prepared (draft) Region H Water Plan. The hearing on July 12 will be held in the morning in conjunction with the RHWPG meeting. The hearing on July 14 will be held in the evening in the Greenway Plaza area of Houston. To increase the visibility of the draft Region H Water Plan during the thirty days preceding the public hearings and the sixty day comment period following these hearings, a number of targeted meetings will be held in cooperation with other organizations in the region.

10.1.3 Targeted Meetings during Plan Development

Through the efforts of RHWPG members, members of other RWPG's, TWDB and the Natural Resources Conservation Service of the U.S. Department of Agriculture, a meeting to assist with review of agricultural water demands was held on February 26, 2003. Twenty-three (23) representatives from these organizations and from rice-growing counties in Regions H, I, K and P met at the Texas Agricultural Extension Service Auditorium at Bear Creek Park in west Houston. The purpose of the meeting was to provide a forum for the explanation of TWDB's methodology to calculate the draft irrigation water demands, which showed a significant decline from the demands that were included in the 2002 State Water Plan. The agenda included presentations on the TWDB methodology, the NRCS role in generating county irrigation demand projections, and alternative methods for calculating agricultural irrigation water demands.

Regular interaction with and updates to the 40-member Galveston Bay Freshwater Inflow Group (GBFIG) provided a forum for communication with environmental and conservation organizations and commercial and recreational fisher groups, as well as the GBFIG members from business and state and local agencies. GBFIG continues to work on developing management strategies for meeting the freshwater inflow targets that are endorsed in the 2001 Region H Water Plan. GBFIG met in conjunction with the RHWPG on two occasions.

10.1.4 Public Notices and Press Releases

Media coverage was sought in conjunction with each series of public meetings or hearings. For each series, paid meeting notices were placed in fourteen newspapers providing service

to all fifteen of the counties in Region H. Direct first-class mailings to county judges and mayors accompanied the issuance of public notices. For public hearings on the Initially Prepared Region H Water Plan, two additional newspapers were added to the publication list for paid notices, and approximately 1,800 individuals also received direct mail notice. Press releases were sent to eight outlets in television and radio and forty outlets in the print media. Press releases announcing the meetings also were sent to organizations that might distribute the information through their newsletters or websites.

Paid notices were placed in 14 newspapers in April 2004 and notices were mailed to county judges and mayors in the region as well as the 16 RWPG's statewide. These notices explained an application made to the TWDB in response to a Request for Proposals issued in January 21, 2004 for supplemental funding of additional studies to aid development of the updated Region H Water Plan. The notice provided 30 days for comment to the Executive Administrator of the TWDB.

10.1.5 Region H *Update*

A newsletter used during the development of the 2001 RWP to provide summary coverage of the plan while it was being prepared was to be used only once in the current planning effort, as a summary of the Initially Prepared Plan. Instead, a bound version of the Executive Summary to the draft Plan, together with an enclosed CD version of the entire plan was distributed both before and during the public comment period. The Executive Summary provided a brief summary of plan development, and particularly of water shortages and water management strategies suggested as solutions to the identified shortages.

10.1.6 Texas Water Development Board Internet Site

The Region H Water Planning Group has taken advantage of the Internet site provided by TWDB on its home page (www.twdb.state.tx.us). Upcoming meetings, minutes of previous meetings, and contact information are posted. TWDB has posted a copy of the 2001 Region H Water Plan on its site as well. Data on population and water demand used in preparing the 2006 RWP also were made available on the TWDP site.

10.2 Summary of Public Hearing, January 16, 2002

A public hearing to receive comments on the proposed scope of work for the grant application to update the Region H Water Plan was held on January 16, 2002 at 10 a.m. as part of the regular meeting of the Region H Water Planning Group. The meeting was held at the San Jacinto River Authority offices in Conroe. Three individuals provided comments.

Mr. Ken Kramer, representative from the Lone Star Chapter of the Sierra Club, stated that the first Region H Water Plan identified the needs for Galveston Bay and it identified unique river segments and stream segments. While recognizing the financial constraints of the TWDB, he said that in this second round of planning, Region H should establish the importance of environmental impacts, which were given little attention in the first round. He stated that he hoped this round of planning would provide management strategies for Galveston Bay on a long term basis. He also questioned how much water could be assigned to conservation and drought management. He stated that water conservation may not give us all the water that we need, but it can be very beneficial in the short term and cited the water

conservation program implemented by San Antonio. He stated that drought management as included in RHWP focuses on peak capacity during times of critical drought.

Ms. Linda Shead, Executive Director of the Galveston Bay Foundation, stated that things were put off in the first round of RHWP and hopefully they would take place in the second round of water planning. She urged the RHWPG not to give up and keep the tasks that need to be done in the second phase of water management planning. She also stated that environmental issues did not get addressed in the first round. She expressed concern regarding Tasks 4.2, 4.4 and 4.5 not being done. She further stated that Galveston Bay is part of the whole system and pleaded for RHWPG not to abandon it.

Ms. Carole Baker, representing the Harris-Galveston Coastal Subsidence District, stated that the $5,000 allocated per year for water conservation is a drop in the bucket as to what is needed. She stated that the amount is so inadequate that it might as well be spread elsewhere. She further stated there are hundreds of water conservation plans gathering dust in files at TNRCC. She stated that at a stakeholders meeting this past summer, the lack of accountability and the lack of quantifying was thoroughly discussed, but a consensus could not even be reached. She further stated that water conservation is considered the second most important water strategy cited when polled. She urged the RHWPG to get serious about water conservation and set goals.

Mr. Taylor responded to the public comments on the draft scope of work for the next phase of Regional Water Planning:

- There has been no money allocated to look at existing or future instream flow conditions within our rivers. Instream flow analysis is currently only considered relative to impacts generated from a proposed water management strategy.
- The money for Galveston Bay and Tasks 4.2, 4.4 and 4.5 is in there if RHWPG wants to fight for it.
- The money allocated for water conservation is grossly inadequate.

Mr. Taylor stated that in order to meet the minimum requirements of Senate Bills 1 and 2 it would cost 1.2 million dollars.

Table 10-1: Attendance at Public Hearing, January 16, 2002

16 January, 10:00 a.m., SJRA Offices, Conroe

Interested Public
Dominic Abenz, City of Houston, Houston
Carole Baker, HGSC, Friendswood
Jerry Burns, City of Pearland, Pearland
Andrew Chaskin-Dours, WPRC, Ft. Worth
Tom Clark, Brazos River Authority, Waco
Robert Istre, GCWA, Texas City
Ken Kramer, Sierra Club, Austin
Carl Masterson, HGAC, Houston
Tom Ray, LAN, Waco
Paul Schumann, Sugar Land
Linda Shead, GBF, Webster
Andrea Walters, ExxonMobil, Houston

Region H Water Planning Group Members
Jim Adams, SJRA, Conroe
Roosevelt Alexander, Retired, Katy
John Bartos, Galveston Bay Fdn., Houston
Robert Bruner, Rancher, Huntsville
Mary Alice Gonzales, Stewart Title, Fort Bend
Jack Harris, Brazoria Co. Comm., Pearland
David Jenkins, Farmer, Winnie
Carolyn Johnson, Dow Chemical, Freeport
James Morrison, Walker County Rural Water Supply Corp., Huntsville
James Murray, ExxonMobil, Houston
Tom Michel for Ron Neighbors, HGSD, Friendswood
Gary Oradat, City of Houston, Houston
Ek Shackelford for Jack Searcy, NHCRWA
Gary Stobb, Harris County
Michael Sullivan, Kingwood
Larry Taylor, Friendswood
William Teer, Retired, Leon County
Steve Tyler, Steve Tyler Creative Services, Livingston
Jim R. Sims for Danny Vance, TRA, Arlington
Harold Wallace, WHCRWA, Houston
Kerry Whelan, Reliant Energy, Houston
Ernest Rebuck, TWDB, Austin
Bill Roberts, TWDB, Austin
Woody Woodrow, TPWD, Clear Lake City

Consulting Team
Glenda Callaway, Ekistics
Mark Lowry, TC&B
Mike Reedy, TC&B
Andy Sterbenz, KBR
Jeff Taylor, KBR

10.3 Summary of Public Meetings, December 2002

During December 2002, public meetings were held in the evening at two locations in Region H. Since Region H is a large region, the locations were selected to provide as convenient as possible access to the meetings for members of the interested public. Sites selected were:

E. B. Cape Center, City of Houston, Houston, 7 p.m., December 5, 2002 (central/south)

Montgomery County Memorial Library, Conroe, 7 p.m., December 10, 2002 (north)

Paid meeting notices were placed in fourteen newspapers in the region providing distribution to all 15 counties in the region. Press releases announcing the meeting were sent to 40

papers, as well as radio and television stations. Region H Planning Group members also assisted by advising interested groups of the meetings. The meeting notice provided a specific address for locating the population projections on the TWDB website.

The purpose of the meetings was to provide an update on Region H water planning and to provide the public an opportunity to review the population projections that would be used to develop the 2006 RWP.

Each of the meetings was designed to follow a similar format:

- A brief presentation presenting the draft population projections and providing TWDB criteria for allowing changes to sub-county population projections;
- Questions on the presentation;
- Comments from those registering to speak;
- General discussion as time or interest of attendees allowed.

Comments received at those meetings are summarized below. Presentation slides are included at Appendix A.

Attendance at both of the meetings was disappointing. On the 5th of December, a total of 9 people attended the meeting at the **E. B. Cape Center** in Houston. Of those, 2 were not Planning Group or consulting team members. No one made formal comments.

On the 10th of December, 6 people attended the meeting held at the **Montgomery County Memorial Library** in Conroe. Only one of those was a member of the interested public. The major issue Mr. Mannchen raised was that the population projections would become self-fulfilling prophecies and that the RHWPG (and the entire regional water planning process) needed to consider controlling growth to live within available water supplies, or at least to minimize the development of new supplies. Given the small size of the group, there ensued an extended discussion of the philosophies embedded in the water planning process with respect to meeting the needs of population growth.

Table 10-2: Attendance at Public Meetings, December 2002

5 December, E. B. Cape Center, Houston

Interested Public	**Region H Water Planning Group Members**
Kay Willcox, Anahuac	Jim Adams, SJRA, Conroe
Pudge Willcox, CLCND, Anahuac	Jack Harris, Brazoria County, Pearland
	Michael Sullivan, RHWPG, Kingwood
	Consulting Team
	Glenda Callaway, Ekistics, Houston
	Mark Lowry, TC&B, Houston
	David Parkhill, KBR, Houston
	Mike Reedy, TC&B, Houston

10 December, Montgomery County Memorial Library, Conroe

Interested Public	**Region H Water Planning Group Members**
Brandt Mannchen, Sierra Club, Houston	Judge Mark Evans, RHWPG Vice Chair, Trinity County
	Consulting Team
	Glenda Callaway, Ekistics, Houston

Mark Lowry, TC&B, Houston
David Parkhill, KBR, Houston

10.4 Summary of Public Meetings, March 2003

Public meetings to review draft water demand projections were held during the month of March 2003. Region H hosted public meetings at four locations to provide as convenient as possible access to the meetings for members of the interested public. Meetings were held at the following sites:

San Jacinto River Authority offices, Conroe, 10 a.m., March 5, 2003 (in conjunction with a regular RHWPG meeting)

San Jacinto College-South, Houston, 7 p.m., March 17, 2003 (Houston and south)

Houston-Galveston Area Council, Houston, 1:30 p.m., March 18, 2003 (Greenway Plaza area/central; meeting focused on local governments)

Walker County Courthouse, Huntsville, 7 p.m., March 20, 2003 (north)

The purposes of the meetings were to present the water demand projections prepared by the TWDB for use in planning for Region H, to review TWDB requirements for documentation to accompany requests for changes, and to receive comments and requests for corrections or changes to the projections from attendees. The meetings also served as an opportunity to provide an update on Region H water planning and to elicit any concerns attendees have about planning for water supply in the region. Meetings were informal, with questions and discussion encouraged. Presentation slides are included at Appendix B.

Other than the meeting held in conjunction with the RHWPG meeting, attendance at these meetings was extremely low. Although those who attended gave positive feedback on the material presented, most were there to learn rather than to comment. In a few cases, specific comments were made, and those are noted below.

At the meeting on March 5, Mr. Ken Kramer of the Lone Star Chapter of the Sierra Club stated that the Sierra Club had contracted with a firm to do an analysis of the water demand for several regions including Region H. He stated that it may not be done by the time of the public hearing but they will submit the analysis as soon as possible. He also stated that the Sierra Club thought the 2000 projections were too high because of conservation related to the new plumbing codes. He also stated that some water conservation experts have looked at the numbers and think the reduction in demand due to conservation may be 23 GPCD instead of 16 GPCD. He further stated that there are several bills related to water conservation before the legislature. He urged the group to make sure that the public has up-to-date numbers for review and comment, and said that the latest numbers needed to be put on the TWDB website.

Ms. Carolyn Johnson and Mr. James Murray, RHWPG members, stated that in 2000 their industries were deeply into a water conservation mode because of the drought. They both stated that the 30-40% decrease in future water demand was incorrect because of the circumstances of that year.

Mr. David Jenkins stated that the methodology used by TWDB was a problem because 2000 was a drought year and a very bad year for rice farmers. He stated the price of rice was low and federal policy was against the rice farmer. He also suggested that aquaculture should be treated as agriculture rather than as industry.

Mr. Michael Klaus, a resident of Pearland, stated that any water that we receive should definitely be conserved. He said that he wanted to turn on the tap and get clean, safe water. He thanked the members of the Region H Water Planning Group for the work that they are doing.

The meeting held on the 18th of March at the Houston-Galveston Area Council was aimed primarily at attracting review and comment by local governments. Mr. Ivan Langford, the manager of the Galveston County WCID #1 (Dickinson) said that a problem with the water demand projections is the starting point. He said that the year 2000 information for Dickinson needs to be corrected, and then the per capita numbers would be correct. Mr. Lowry responded that Mr. Langford should send the correct information to Mr. Jim Adams, Chair of the RHWPG, with a request to use that data to determine per capita water use and the number of people in the district.

Mr. Jerry Burns, with the City of Pearland, said that his area has 8,000 acres of prime real estate that is going to explode. He said that between the time the Census was done and when it was published, the City of Pearland gained 5,000 people. Mr. Lowry responded that population now shown in County-Other can be shifted into Pearland. He noted that the Plan will be revised on a five-year cycle, so changes can be made when needed.

Mr. Larry Mayberry said that projections for the City of Sealy probably are OK. A new Wal-Mart Distribution Center is being built that will eventually employ 1,400. Employment in the short term is expected to be 400.

Mr. Ken Kramer, Sierra Club, Austin, asked about the process for changes once information has been submitted to Mr. Adams. Mr. Lowry responded that the information will be given to the consulting team to determine if it meets the TWDB criteria. The consultants will talk to the submitter for any needed additional data.

Mr. Kramer asked about the per capita numbers. He said that TWDB factored in the plumbing code, but not other laws affecting water efficiency. He noted that the only way to comment on the methodology was through each region, not at the state level. Mr. Lowry confirmed that comments should go to each region. He said that Region H will forward all comments to TWDB even if no specific change in the projections is requested.

Mr. Parkhill and Mr. Lowry noted that, unlike the first round of planning, “advanced conservation” is not included in the projected numbers for this planning round. It cannot be assumed and is to be treated as a water management strategy.

Table 10-3: Attendance at Public Meetings, March 2003

5 March, 10:00 a.m., SJRA Offices, Conroe

Interested Public

Wayne Ahrens, Dannenbaum, Houston
David Alders, Region I
Fred Bauhof, CH2M Hill
Brad Brunett, BRA, Waco
John H. Demel, City of Panorama Village, Conroe
Diane Flynn, PostWood MUD, Spring
Dan Hardin, TWDB, Austin
Jace Houston, Subsidence District, Friendswood
Robert Istre, GCWA, Texas City
Mike Jackson, SJRA, Conroe
Kathy Jones, Lone Star GCD, Conroe
Michael Klaus, Pearland
Kevin Kluse, TWDB, Austin
Ken Kramer, Sierra Club, Austin
Orval R. Love, LSCD, Spring
Tom Michel, HGCSD, Friendswood
Paul R. Nelson City of Houston, Houston
Will T. Omiel, City of Splendora, Splendora
Diane Otto, Solutia/TCC, Alvin
Tom Ray, LAN, Houston
Ed Schackelford, Houston
Jimmie Schindewolf, NHCRWA, Houston
Chuck Settle, Espey Consultants, Conroe
Jim Sims, Huntsville
Joyce Stubblefield, City of Splendora, Splendora
Alisa Talley, City of West University, West U. Place
David A. Van Dresar, City of Texas City, Texas City

Region H Water Planning Group Members

Jim Adams, Conroe
Roosevelt Alexander, Katy
John Bartos, Houston
Robert Bruner, Huntsville
Mark Evans, Trinity
Jack Harris, Pearland
David Jenkins, Winnie
Carolyn Johnson, Brazosport
James Murray, Baytown
Ron Neighbors, Friendswood
Gary Stobb, Harris County
Michael Sullivan, Kingwood
Jeff Taylor, Houston
Larry Taylor, Friendswood
Steve Tyler, Livingston
Kerry Whelen, El Lago
Ernest Rebuck, Austin
Woody Woodrow, Clear Lake

Consulting Team

David Bradley, KBR, Houston
Glenda Callaway, Ekistics, Houston
Mark Lowry, TCB, Houston
David Parkhill, TCB, Houston
Mike Reedy, TCB, Houston

17 March, 7 p.m., San Jacinto College South, Houston

Interested Public

None

Region H Water Planning Group Members

Jim Adams, SJRA, Conroe

Consulting Team

Glenda Callaway, Ekistics, Houston
Greg Graml, KBR, Houston
David Parkhill, TCB, Houston
John Seifert, LBG-Guyton, Houston

18 March, 1:30 p.m., Houston-Galveston Area Council, Houston

Interested Public
James Burns, City of Pearland
Ken Kramer, Sierra Club, Austin
Ivan Langford, Galveston County WCID#1, Dickinson
Larry Mayberry, City of Sealy
Carl Masterson, HGAC, Houston

Region H Water Planning Group Members
Jim Adams, SJRA, Conroe

Consulting Team
David Bradley, KBR, Houston
Glenda Callaway, Ekistics, Houston
Greg Graml, KBR, Houston
Mark Lowry, TCB, Houston
David Parkhill, TCB, Houston
John Nelson, LBG-Guyton, Houston

20 March, 7 p.m., Walker County Courthouse, Huntsville

Interested Public
None

Region H Water Planning Group Members
Jim Adams, SJRA, Conroe

Consulting Team
Glenda Callaway, Ekistics, Houston
Greg Graml, KBR, Houston
Mark Lowry, TCB, Houston
David Parkhill, TCB, Houston
John Seifert, LBG-Guyton, Houston

10.5 Summary of Public Hearings to Amend the 2001 Region H Water Plan, October 2004 and January 2005

During the course of developing the updated 2006 Region H Water Plan, several water providers requested that the 2001 Region H Water Plan be amended to accommodate changed conditions so their actions would be viewed as consistent with the plan by the TWDB and the Texas Commission on Environmental Quality (TCEQ). This plan amendment required the same full notice and hearing process as would adoption of a full Regional Water Plan. Notice of a request to TWDB for financial assistance to incorporate the changes reflected in the amendment was coupled with the public notice on the proposed plan amendment.

A public hearing to receive comments on the proposed amendments to the 2001 Plan and on the request for financial assistance to TWDB was held at 10 a.m. on October 6, 2004, preceding a regularly scheduled RHWPG meeting. Four individuals made formal comments at the hearing: Bob Stokes, Galveston Bay Foundation; Ken Kramer, Sierra Club Lone Star Chapter; Evelyn Merz, Sierra Club Houston Regional Group; and Jackie Chance, Montgomery County WCID #1. The public notice, slide presentation from the hearing, comments and responses made at the hearing and two written comments and responses are

included in the documentation for *Amendment 1 to the 2001 Region Water Plan* submitted by the RHWPG.

After the public hearing on the proposed amendment to the 2001 RWP was held on October 6, 2004, it was determined that additional time for comment was required before the RHWPG could adopt the amendment. As a result, the period for written comments was extended to January 4, 2005 and the decision rescheduled for its meeting on January 5, 2005. Appropriate notice was published and mailed to all required parties. No additional comments were received. A copy of the notice is included in *Amendment 1 to the 2001 Region Water Plan.*

10.6 Public Review and Comment on Initially Prepared Plan

10.6.1 Identification of Libraries

During the first phase of planning the RHWPG contacted each of the County Judges in the region and requested their assistance in identifying the public library in each county that would be most appropriate for placing a copy of the initially prepared Draft Regional Water Plan for public review. The libraries selected, together with the County Clerk's office in each county, are listed in Table 10-4.

10.6.2 Public Notice and Press Releases

As required by Section 357.12 of the Texas Administrative Code, notice of the upcoming public hearings on the initially prepared Draft Regional Water Plan was provided by several means.

- Notice of the public hearings, written comment period, and location of copies of the Draft Plan for public review were posted in each county in the region.
- Paid ads providing notice of the public hearings, written comment period, and location of copies of the Draft Plan for public review were placed in 16 newspapers in the region.
- In accordance with 31 TAC section 357.12(5)(A-E), direct notice by first-class mail was made to the following:

  (a) 140 Mayors

  (b) 15 County Judges

  (c) 5 Special districts and river authorities in the region as identified by the Texas Commission on Environmental Quality (TCEQ)

  (d) 1,347 Community water systems as identified by TCEQ

  (e) 353 Water rights holders as identified by TCEQ

Notice of the hearings also was posted on the Regional Planning section of the TWDB website.

10.6.3 Distribution of Documents for Review and Comment

A public library and the County Clerk's office in each county in Region H were identified to receive review copies of the draft Plan. The Initially Prepared 2006 Region H Water Plan was placed in the designated public repositories, listed in Table 10-4, on June 8, 2005. Both hard copy and CD-ROM versions of the draft Plan were made available. The document also was placed on the TWDB website.

Table 10-4: Public Repositories of the Region H Regional Water Plan

AUSTIN COUNTY County Clerk County Courthouse 1 East Main Bellville, TX 77418	**AUSTIN COUNTY** Gordon Library 917 Circle Drive Sealy, TX 77474
BRAZORIA COUNTY County Clerk County Courthouse 111 East Locust Angleton, TX 77515	**BRAZORIA COUNTY** Angleton Public Library 401 East Cedar Angleton, TX 77515
CHAMBERS COUNTY County Clerk County Courthouse Anahuac, TX 77514	**CHAMBERS COUNTY** Chambers County Library – Main Branch 202 Cummings Anahuac, TX 77514
FORT BEND COUNTY County Clerk 301 Jackson Richmond, TX 77469	**FORT BEND COUNTY** George Memorial Library 1001 Golfview Richmond, TX 77469
GALVESTON COUNTY County Clerk County Courthouse 722 Moody Galveston, TX 77550	**GALVESTON COUNTY** Rosenberg Library 2310 Sealy Galveston, TX 77550
HARRIS COUNTY County Clerk Harris County Administration Building 1001 Preston Avenue Houston, TX 77002	**HARRIS COUNTY** Houston Public Library 1st Floor, Bibliographic Information Center 500 McKinney Houston, TX 77002
LEON COUNTY County Clerk Leon County Courthouse Centerville, TX 75833	**LEON COUNTY** Leon County Library 129 East Main Centerville, TX 75833

LIBERTY COUNTY
County Clerk
County Courthouse
1923 Sam Houston
Liberty, TX 77575

LIBERTY COUNTY
Sam Houston Regional Library
And Research Center
FM1011
Liberty, TX 77575

MADISON COUNTY
County Clerk
101 West Main, Room 102
Madisonville, TX 77864

MADISON COUNTY
Madison County Library
605 South May
Madisonville, TX 77864

MONTGOMERY COUNTY
County Clerk
County Courthouse
301 N. Thompson
Conroe, TX 77301

MONTGOMERY COUNTY
Montgomery County Central Library
104 Interstate 45 North
Conroe, TX 77301

POLK COUNTY
County Clerk
County Courthouse, 1st Floor
101 West Church
Livingston, TX 77351

POLK COUNTY
Murphy Memorial Library
601 West Church
Livingston, TX 77351

SAN JACINTO COUNTY
County Clerk
County Courthouse
#1 Highway 150
Coldspring, TX 77331

SAN JACINTO COUNTY
Coldspring Library
220 South Bonham
Coldspring, TX 77331

TRINITY COUNTY
County Clerk
County Courthouse
1st and Main
Groveton, TX 75845

TRINITY COUNTY
Blanche K. Werner Library
Highway 19
Trinity, TX 75862

WALKER COUNTY
County Clerk
County Courthouse
1100 University Avenue
Huntsville, TX 77340

WALKER COUNTY
Huntsville Public Library
1216 – 14th Street
Huntsville, TX 77340

WALLER COUNTY
County Clerk
County Courthouse
836 Austin Street
Hempstead, TX 77445

WALLER COUNTY
Waller County Library -
Brookshire/Pattison
3815 Sixth Street
Brookshire, TX 77423

10.7 Summary of Public Hearings, Public Meetings, and Written Comments

10.7.1 Overview of Public Hearings, July 2005

The Region H WPG chose to hold public hearings on its Initially Prepared Region H Water Plan at two locations in the region. One hearing was held at 10 a.m. in conjunction with a scheduled RHWPG meeting in Conroe. The second was held at 6:30 p.m. at the Houston-Galveston Area Council which is centrally located in the region and accessible to the largest part of the region's population.

Proceedings at each of the public hearings followed a similar format.

- Welcome and Introductions: Jim Adams, RHWPG Chair, welcomed attendees and made introductions at the July 12 hearing; John Bartos, RHWPG Member, welcomed attendees and made introductions at the July 14 hearing.
- A brief presentation of the draft Plan was made by the consulting team. (Copies of presentation slides are included as Appendix C.)
- Formal comments or questions were given by attendees who registered to speak.
- Information on the written comment period and process for adopting the Plan was provided.
- Informal dialogue, including discussion of responses that were known at the time, followed.

Handouts for each meeting consisted of a copy of the Executive Summary to the Initially Prepared Region H Water Plan, and a copy of the presentation slides.

A certified court reporter prepared a formal record of proceedings at each hearing site. Summaries of formal comments are based on these proceedings. Attendance at the Public Hearings is shown in Table 10-5.

It was announced in the public notice and at each public hearing site that written comments on the initially prepared Draft Regional Water Plan would be accepted through September 16, 2005 for inclusion in the published draft plan. **Error! Reference source not found.** lists the individuals and organizations that provided written comments.

Written comments and responses to them are included in the Appendix.

Table 10-5: Attendance at Public Hearings, July 2005

12 July 2005, SJRA Offices, Conroe

Interested Public

Lloyd A. Behm, BGCD, Navasota
Justin Bowie, City of Sugar Land, Sugar Land
Jackie W. Chance, Sr., Mont. Co. WCID 1, The Woodlands
Glenn Clingenpeel, TRA, Arlington
Liza Cushion, HARC, The Woodlands
Jeff DallaRosa, TCEQ-GBEP, Webster
Jennifer Elms, Jones & Carter, Houston
Don Farris, Madison County, Madisonville
Ronald Geesing, HGSD, Friendswood
Robert Gresham, Mid-East Texas GCD
David Harrison, Forest Primeval, Dayton
Mike Jackson, SJRA, Conroe
Bud Johnson, ROG, Crosby
David Kocurek, City of Alvin, Alvin
Ken Kramer, Sierra Club, Austin
Lng Li, HARC, The Woodlands
Alison Mackey, TRA, Arlington
Tom Michel, HGSD, Friendswood
Richard Ramirez, River Plantation MUD, Conroe
Jimmie Schindewolf, NHCRWA, Harris Co.
Jim Sims, TRA, Huntsville
Mike Turner, USGS, Houston
Pris Weeks, HARC, The Woodlands
James Yeager, City of Alvin, Alvin
Butch Young, Mont. Co. WCID 1, Spring
Ray Zobel, Malcomson Road U.D., Tomball

Region H Water Planning Group Members

Jim Adams, Conroe
Roosevelt Alexander, Katy
Brad Brunett for John Baker, Waco
John Bartos, Houston
John Blount, Harris County
Robert Bruner, Huntsville
Mark Evans, Trinity
Ted Long for Jason Fluharty, Houston
Carolyn Johnson, Brazosport
Marvin Marcell, Fort Bend
Ron Neighbors, Friendswood
Bill Teer, Leon County
Danny Vance, Arlington
Bill Roberts, Austin
Woody Woodrow, Clear Lake

Consulting Team

Glenda Callaway, Ekistics Corporation
Lucia Lee, KBR
David Parkhill, TCB
John Seifert, LBG-Guyton
Andy Sterbenz, KBR

Table 10-6: Attendance at Public Hearings, July 2005 (continued)

14 July 2005, Houston-Galveston Area Council, Houston

Interested Public
Cindy Bartos, Houston
Emmett Abati Doe, Renova W.P., Houston
Helen Drummond, TCEQ-GBEP, Webster
Traci Hartsfield, City of Shenandoah, Shenandoan
Tracy Hester, Bracewell, Houston
Bernard Legrand, GBCPA, Houston
Joy Lindsay, Sierra Club, Houston
Brandt Mannchen, Sierra Club, Houston
Carl Masterson, HGAC, Houston
F. Steve Petersen, Malcolm Pirnie, Houston
Daisy Quigley, Houston
Charles Shumate, BGE, Houston
Cynthia Pickett Stevenson, GBF, Houston
Don Stevenson, Houston
Ben Thomas, Renova, Houston
Jim White, Houston

Region H Water Planning Group Members
John Barton, Houston
Carolyn Johnson, Freeport
Sherry Cordrey for Bill Roberts, Austin

Consulting Team
Jerry Allen, KBR
Glenda Callaway, Ekistics Corporation
Lucia Lee, KBR
Jason Nelson, TCB
Leisa Nelson, KBR
David Parkhill, TCB
John Seifert, LBG-Guyton
Andy Sterbenz, KBR

10.7.2 Summary of Public Meetings, August 2005

To increase the opportunities for public involvement in the review and comment process, the RHWPG supplemented the two Public Hearings with four Public Meetings. Partner organizations hosted these meetings and assisted with publicizing them to their memberships and other interested persons in their areas. Presentations of the IPP by the RHWPG consultant team were similar to that given at the public hearings, but were tailored to address the specific interests of the audience.

August 11, 2005: The Galveston Bay Foundation and the Lone Star Chapter of the Sierra Club co-hosted a meeting at Brady's Landing restaurant along the Houston Ship Channel. Notice of the meeting was distributed, principally by email, to about 3,000 people; about 60 people attended. Most of the questions involved environmental considerations and a concern for water quality impacts. Two written comments were received at the meeting.

August 16, 2005: The Fort Bend Subsidence District hosted a meeting at the Rosenberg Civic Center. In spite of an attractive location and good support from FBSD, this meeting was poorly attended. Other than consulting team and RHWPG members, only two additional people attended, and both were associated with RHWPG members.

August 18, 2005: The Huntsville-Walker County Chamber of Commerce hosted a meeting at the LaQuinta Inn in Huntsville. The Chamber made extraordinary efforts to publicize the meeting, including placing articles in their newsletter, in the local newspaper, and on the local radio, as well as listing the meeting on their website. In spite of that, a contentious school board meeting that ran overtime and another conflicting city meeting

resulted in fairly low attendance of this meeting. There were 16 in attendance, of whom eight were members of the consulting team or the RHWPG. The Chamber offered to distribute the meeting materials at their Board Meeting which was scheduled for the following day.

August 23, 2005: The North Harris County Regional Water Authority hosted a meeting at their offices. The consulting team mailed notices of this meeting to about 260 organizations and individuals from a mailing list provided by the NHCRWA; about 50 people attended. Many of those attending the meeting represented municipal utility districts or other water entities. After the presentation, a number of them requested extra copies of the Executive Summary and the slide presentation to share with other board members.

Table 10-6: Attendance at Public Meetings, August 2005

11 August 2005, 6:30 p.m., GBF/Sierra Meeting, Brady's Landing, Houston

Interested Public

Catherine Albrecht, Sierra Club, Alvin
Richard Allison, UHCL, Houston
Carole Baker, HGSD, Friendswood
Don Bass, Highland Bayou Q., Hitchcock
Craig Bouvgeod, Houston Audubon Society, Houston
Mary Brown, GBF, Houston
Jerry Burns, City of Pearland, Pearland
Mrs. Jerry Burns, Pearland
Louis Decker, Dickinson City Council, Dickinson
Jim Doberstine, GBF, Webster
Tom Douglas, GBF, Houston
John Foster, Fosters Tree Service, Houston
Alecya Gallaway, EIH, Clear Lake
Ken Kramer, Sierra Club, Austin
Lorraine Leavell, Houston
Jim Lester, HARC, The Woodlands

Region H Water Planning Group Members

John Bartos, Houston
James Murray, Baytown
Jeff Taylor, Houston

11 August 2005, 6:30 p.m., GBF/Sierra Meeting, Brady's Landing, Houston (Continued)

Mary Stark Love, GBF, Houston
Timothy Love, GBF, Houston
Brandt Mannchen, Houston Sierra Club, Houston
Bill Matthews, Texas Corinthian Yacht Club, Houston
Chris McCarthy, CH2M Hill, Houston
Evelyn Merz, Houston Sierra Club, Houston
Sarah Metzger, City of Pasadena, Pasadena
Tina Petersen, Univ. of Houston, Houston
Charlotte Ray, TAMUG, Galveston
Samme Ray, TAMUG, Galveston
Suz Rosenberg, GBEP-TCEQ, Webster
Chuck Settle, Espey Consultants, Houston
Kathy Settle, Houston
Tamara Shelby, Houston
Jacqueline Smith, GBF, Houston
Lawrence Spence, HISD, Houston
Bob Stokes, GBF, Houston
Alicia Strogen, GBF, Galveston
Connie Tilton, ExxonMobil, Baytown
Gian Villarreal, Univ. of Houston, Houston
Paul Villforth, UTSPH, Houston
Natalie Wiest, GBIC-TAMUG, Houston Canoe Club, League City
Kay Willcox, Anahuac
Pudge Willcox, CLCND, Anahuac
Page Williams, Sierra Club, Houston
Matt Woodruff, GBF, Houston

Consulting Team
Glenda Callaway, Ekistics
Lucia Lee, KBR
Jason Nelson, TCB
David Parkhill, TCB
John Seifert, LBG-Guyton
Andy Sterbenz, KBR

16 August 2005, 6:30 p.m., Fort Bend Subsidence District Meeting at Rosenberg Civic Center, Rosenberg

Interested Public
Cathy Dominguez, BRA, Waco
Tom Michel, FBSD, Friendswood
Wanda Sebesta, FBSD, Richmond

Region H Water Planning Group Members
Jim Adams, Conroe
Marvin Marcell, Sugar Land

Consulting Team
Glenda Callaway, Ekistics
Jason Nelson, TCB
John Seifert, LBG-Guyton
Andy Sterbenz, KBR

18 August 2005, 5:15 p.m., Huntsville-Walker County Chamber of Commerce Meeting, La Quinta, Huntsville

Interested Public

Toni Bruner, Huntsville
Tom Ginter, City of Madisonville, Madisonville
Pam Marklan, MK, Huntsville
Andrew Martinez, TRA, Huntsville
Dee McFarland, Huntsville-Walker County Chamber of Commerce, Huntsville
Jon Muncrief, USDA-NRCS, Huntsville
Jim Nolan, Spring
Jim Sims, TRA, Huntsville
(One late arrival didn't sign in.)

Region H Water Planning Group Members

Jim Adams, Conroe
Robert Bruner, Huntsville
Danny Vance, Arlington

Consulting Team

Glenda Callaway, Ekistics
Michael Reedy, TCB
John Seifert, LBG-Guyton
Andy Sterbenz, KBR

23 August 2005, 6:30 p.m., North Harris County Regional Water Authority Meeting at NHCRWA Offices, Houston

Interested Public

Rudy Avila, MUD 52, Houston
Malcolm Beckendorff, Costello, Houston
Roger Blankenheim, Fountainhead MUD, Houston
John Clough, HCWCID 113, Cypress
Dale Conger, Cobb Fendley, Houston
Barbara Evans, Faulkey Gully MUD, Cypress
Kelly Fessler, NHCRWA, Spring
Rick Gable, MUD 82, Spring
Dennis Garver, MUD 202, Houston
Bud Gessel, Timber Lane UD, Houston
Row Graham, NHCRWA, Houston
Ralph Hague, Westador MUD, Houston
Gerald Jozwiak, Madisonville
Lonnie Konieczny, MUD 202, Houston
B. Koperwhats, WCID 91, Houston
Sam Kruse, Costello, Houston
Gordon Landwermeyer, Westador MUD, Houston
Robert F. Logan, Faulkey Gully MUD, Cypress
David Lopez, MUD 202, Houston
Jerry Lovelady, Porter SUD, Porter
Tom Matken, AEI Engineers, Spring
G. B. Meriwether, A&S Engr., Houston
James Messer, Timberlane U.D., Spring
Tom Mohn, HC MUD 357, Houston
Barbara Payne, NHCRWA, Houston
John Porea, FG MUD, Cypress
Alan Potok, TCB, Houston
Pam Puckett, Costello, Houston
Jim Pulliam, NHCRWA, Houston
Mike Rhodes, MUD 286, Houston
George Richardson, HC MUD 286
Bob Ring, EHRA, Houston
Tom Rolen, TCB, Houston
Jimmie Schindewolf, NHCRWA, Houston
Lenox Sigler, RWA, Houston
Gary Sundstrom, HCMUD 32, Spring
Patrick Tcoumons, Hou. W.8 UD, Houston
David Tinney, LJA, Houston
Mike Voinis, Cobb Fendley, Houston
John Walker, MUD 43, Spring
Jim Watso, EHRA, Houston
Hugh Wynn, Spring

Region H Water Planning Group Members

Jim Adams, Conroe

Consulting Team

Glenda Callaway, Ekistics
Lucia Lee, KBR
Jason Nelson, TCB
Michael Reedy, TCB
John Seifert, LBG-Guyton
Andy Sterbenz, KBR

10.7.3 Comments

Public Hearing, July 12, 2005: Chairman Adams called for speakers. Their comments are summarized below in the order in which they spoke.

Mr. Ken Kramer (representing the Lone Star Chapter of the Sierra Club, Austin) stated that in addition to his verbal comments, the Sierra Club would be submitting written comments on the 2006 Region H Plan. His comments follow.

First of all, I want to ***commend all of you*** for all the hard work that you put into this revision of the Region H plan. As you know, I've followed the process pretty closely over the last several years, and I understand that a lot of efforts have been made by Jim, the San Jacinto River Authority, and the consultants and each member of the regional planning group. And it's a big enterprise, one that takes a lot of time and effort, and I appreciate all of the time and effort that's been put into it. I do want to just hit about three points that we will develop a little more in our comments. There will be other comments on other topics we will make.

I also want to commend you for acknowledging the ***importance of environmental flows*** to Galveston Bay in the Region H plan. Very few regions, in our opinion, in the first round of regional planning gave adequate consideration to environmental flows. And Region H was one of the few that actually did incorporate and acknowledge the importance of that. We admire the fact that you're going forward with incorporating that into your plan. Obviously, the thing that we all have to work on from this point on is the management strategies that will actually result in maintaining those flows to the Galveston Bay system. And there are some things we want to look at more closely in terms of recommending ideas to you.

Second thing is I also commend Region H for recommending that all the municipal Water User Groups that have water shortages look to adopting the ***best management practices*** that were recommended by the State Water Conservation Task Force that I served on in 2003 and 2004. One of the things though -- and I also commend the City of Houston for wanting to incorporate into the Region H plan the savings they anticipate from water conservation, even though they don't come up with a shortage under the plan system here. I do want to say that we want to ***look more closely at the impact of water conservation in terms of meeting the region's water needs*** over the next 50 years or so. We are interested in seeing whether or not the region has really maximized the potential for water conservation in the plan because I think that is an incredibly important first step in trying to meet the region's water needs. Specifically on industrial water conservation, I just want to mention one thing that I think is -- may seem to be a minor point, but I think it's sort of an important one in many ways, and that is that the proposed plan, as I think the 2001 plan -- ***does not have a quantifiable amount of projected savings from industrial water conservation***, recognizing that because of the diversity of industry in the region, it's very difficult to come up with a very precise estimate of what amount of water might be saved from industrial conservation efforts. But I think we all understand that the movement within industry broadly defined is to try to reduce the amount of water that's used in industry because that is a cost of industry that needs to be addressed and will help overall in the unit cost of production. And we would anticipate that there will be some industrial water conservation savings over the next 50 years. And we think that it would be prudent for the regional planning group to incorporate into the regional

plan some reasonable estimate of projected savings overall from industry, and we're going to look at that more closely and may have a recommendation in that regard.

The final thing I would say about the Region H plan that we do want to emphasize in our comments is a ***disagreement with the initial decision not to include drought management as a water management strategy in the plan***. We feel that given the fact that the state requires drought contingency plans of water suppliers and irrigation districts, that it is important to incorporate into the plan a drought management scenario that allows us to reduce during critical periods the amount of water we would expect that would have to be provided because the drought contingency plans through their implementation would reduce the amount of water otherwise demanded. That is one particular thing that we think needs to be changed in the plan that we will be addressing a little more closely in our written comments.

Just very quickly, on the subject of the ***amendments to the 2001 water plan*** -- I do want to say just for the record that the Sierra Club does oppose the incorporation of the following amendments to the 2001 regional plan just because we feel that that should be deferred to the final decisions about the 2006 plan. This does not indicate a position for or against these particular amendments; but the ones in question are the SJR-City of Houston joint application for unappropriated flows, the City of Houston application for unappropriated flows, the Houston indirect reuse of wastewater return flows, the North Harris County indirect reuse of wastewater return flows and the BRA system operations permit. Together, ultimately, that would account for about 1.3 million acre-feet of water per year. And we believe that it is more appropriate to look at all those in the context of the final decisions on the 2006 plan rather than go forward as amendments on 2001 at this time. We're taking no position on the other proposed amendments in the 2001 plan. Thank you for the opportunity to comment.

Mr. David Harrison (Forest Primeval, Inc., Dayton). I'd hoped to hear more about the ***Luce Bayou transfer of water from the Trinity River*** into Luce Bayou, and my understanding from past surveys that were done and planning that they're going to go put the pumping station at the end of Caper's Ridge on the Trinity River and they want to follow the top of Caper's Ridge. This is probably the most scenic tract of land, the ridge, in Liberty County and when you go down the center of that, you're going to cross a couple of prehistoric archaeological sites that are mentioned in a July 2000 memorandum on it. And you have many miles of bottomland. If you go straight through the bottomland to the upland and then cut across the Luce Bayou, you won't destroy Caper's Ridge, and my main goal here is I really wish the planning committee would consider a more direct route instead of going down Caper's Ridge.

Chairman Adams. This committee doesn't set the direction of it. It will be in the City of Houston and the Coastal Water Authority's design. So they're the people that you need to talk to.

Mr. Harrison. Well, I've talked to them. And I tell you, it's like talking to a brick wall. They plan to go down Caper's Ridge, but I think it's a natural resource. It's unique and it shouldn't be destroyed, and I just wanted to add that as a public comment.

Mr. Jackie Chance, Sr. (Montgomery County WCID #1, The Woodlands). The water plan as I've looked at it seems pretty good. There is a lot of focus on conservation, which I believe is needed, but I think there is ***more need to be addressing sustainable sources of surface water, development of new bodies of water and possibly impounding some water*** that can be permanent supplies if you don't have to worry about seasonal conditions. They not only improve the ecology and the economy of the area around them, they give you a safety zone that you don't have with conservation. You can require conservation, you can try and enforce it, but still it's pretty much up to the individual user to apply that conservation. That's all I have.

Public Hearing, July 14, 2005: RHWPG Member John Bartos called for speakers. Their comments are summarized below in the order in which they spoke.

Mr. Brandt Mannchen (Forestry chair for the Houston Regional Group of the Sierra Club), submitted written comments as well as his verbal comments.

With regard to ***Amendment 1*** -- and actually this refers to Amendment 1 -- the 2001 plan and this plan, which is the 2006 plan; we still are concerned that the Texas Water Development Board's regulations concerning environmental analysis have not been fully followed as far as quantification of certain environmental factors. Some of those include: Wildlife habitat, cultural resources, effects of upstream development on bays, estuaries and arms of the Gulf of Mexico and environmental water needs. We still believe that more needs to be done to make the 2001 amendment and the 2006 plan legit. So we're still concerned about that and would encourage appropriate changes with respect to that.

Secondly, the ***population projections*** that the Region H uses and that the Texas Water Development Board commissions do not take into consideration what the environment and the quality of life will be like before making the projection or even after the projection is made. They don't determine what Texans and Houstonians want for their environment and their quality of life; and what they want in the future. They assume we're going to reach 45.5 million people in the state of Texas and we in essence build to that level. And we're concerned about that because that will have an impact on Houstonians and their children and their grandchildren and their great grandchildren in the future. And they haven't really been asked what they would like to see happen. And we would like to see a survey done that does that -- that asks Texans in each region specifically what would you like to see your quality of life be like and then relate that back to the population projections and the water use demands.

Finally, we'd like to list a couple of things that we support in the plan. We ***support sufficient freshwater inflows*** for optimal year-round habitat and protection for rivers and streams in Galveston Bay and other bays and estuaries to ensure that fish, wildlife, riparian woodlands, forested wetlands and other sensitive areas are protected. We ***support the strong water conservation measures*** for residential, municipal, commercial, industrial, agricultural uses

and would like to encourage even more for Region H. We ***encourage reuse of water return flows*** as long as that is caveated with a guarantee that the rivers and streams and the bays and estuaries aren't harmed by reuse.

We ***support the eight ecologically unique stream segments***. We've also suggested 17 more that we'd like for the Region H to go back and relook at. Those 17 more are either in Sam Houston National Forest, the Wallisville area, Anahuac National Wildlife Refuge, Trinity River National Wildlife Refuge or Brazos Bend and Stephen F. Austin State Parks.

We also support requiring each significant water rights proposal going through a ***public amendment process*** which includes public notification, 30-day public comment period and a public hearing before deciding whether to add the water rights proposal to the Region H water plan. There have been much discussion in the Region H for the past year as to whether that should be, and we think it is important for the public to have an opportunity to look at things like 580 million acre-feet or 421 million acre-feet and significant proposals to take additional water and to use it.

Finally, the Houston Sierra Club ***opposes the Bedias water transfer alternate water management strategy and the East Texas water transfer future water management strategy*** that is in the plan. They will have unacceptable environmental impacts on fish, wildlife,riparian woodlands, bottomland hardwood forests, the west fork of the San Jacinto or the Neches and Sabine Rivers, Sam Houston National Forest or Sabine Lake. We are concerned that we have the alternate and the future water management strategies in the plans when it's not clear legally whether they should be in the plans. So we hope that Region H will look at that as well as the Water Development Board. Thank you.

Mrs. Cynthia Pickett Stephenson (Chair of the Galveston Bay Foundation). GBF ratifies and adopts the statements of the Houston Sierra Club, but we'd like to add a couple of additional comments.

First, we appreciate the targets, but targets are not equivalent to the appropriations that are being given to other stakeholders, so we want some teeth to assure that these freshwater inflows are indeed available to preserve and protect the Galveston Bay estuarine system.

We are also friends of a group called the Texas Conservation Coalition who recently submitted significant reports and studies to the Texas legislature regarding Senate Bill 3, in which they have studied what the citizens of Texas want in the way of environmental quality, quality of life protection. A good majority of those folks want to see that our bays, rivers, streams, wildlife and ecological habitats are protected for their use and enjoyment.

They've also put an economic valuation on tourism, on fishing, on boating and that's quite substantial. And that, again, is an issue that should be looked at, we believe, to support, if any support needs to be done, beyond the quality of life issue, the economic side of that equation.

We think that in evaluating the various management strategies for water, more work needs to be done to evaluate the effects and the quantities of environmental water. We need to make sure we've gotten that right.

We applaud the designation of the unique streams, but we endorse the addition of additional streams as mentioned by our Houston Sierra Club friends. Thank you, but don't disregard the fact that we have less representation on the Region H Water Planning Group in terms of stakeholder groups. We've been given targets instead of opportunities to be heard along with the other groups, with public notice and opportunity for a hearing, and more than targets, but rights to obtain appropriations to protect and preserve our ecosystems. Thank you.

Mr. Bernard Legrand, (GCBPA board member). I do appreciate the speech that the Sierra Club gave. I agree with all that stuff and the Galveston Bay Foundation also. I'm not a specialist. I'm new, so that you would probably find out. I'm more I guess accustomed to atmospheric pollution than water pollution, but I have a question.

As you look at the graph that represents the growth of population in the next 50 years, Harris County has the lion's share of that by a long shot. And I guess you all know that we're a non-attainment area, which means we have a large pollution problem which isn't getting much better, and logic says what goes up must come down and, therefore, it will affect the quality of water coming down plus the runoff from whatever source. And that water is not considered wastewater, therefore, it's not being proposed (for treatment) and so is going right back into the environment. I don't think the report is looking at that. I don't want to go into too much depth. It should be noted and ***some studies should be made to actually look at the quality of the water***, not necessarily so much the quantity. Somewhere in there it should be a balance.

Also I live on the bay, on Galveston Bay, and we're concerned about that and I've seen where some of the segments and reservoirs have been ***dedicated as unique***. I think maybe we should ***add some portion of the coastal zone, the watersheds*** or whatever comes into that because I think there is a potential there for conservation and preservation of fish, you know, and young fish, shrimp and all that kind of stuff. So that should be looked into, too, and added to the list I think.

I think the Sierra Club pointed out, I ***don't think there should be a statement such as to remove the barriers to interbasin transfer***. It should be on a one-to-one basis. I don't think it should be a cover statement. I think we should stay with a one on one basis. ***Desalinization,*** I think that's probably the future of engineering, and we've done a lot of that in Saudi Arabia and probably KBR has done the same thing in Saudi Arabia, and I think we should ask for some of their opinions and experience, how does that work and what's a benefit before we do anything else. It's nice to have an experimental plant in Freeport, but I don't think it's enough. Besides the fact that it's already there, the bay should be used.

What ***troubles me most is the funding***. We're going to increase this and propose that. In these days of deficits, I'm not so sure we can do much and I think maybe it should be addressed in such a way that it's not an empty statement. There should be some backup data

that says we can do that because -- somehow prove that it's feasible. Right now it's pie in the sky more than anything else. Thank you.

Written Comments Received June 1 through September 16, 2005

Eighteen (18)written comments were received by 5:00 p.m. September 16, 2005. After September 16, 2005, two (2) additional letters were received during the Texas Water Development Board review of the initially prepared plan. Copies of those submissions follow.

Table 10-7: Written Comments on the Initially Prepared Plan

Comments Received June 1 through September 16, 2005		
June 7	Brandt Mannchen	Sierra Club, Houston Regional Group
June 8	Lisa Marshall	Self
July 14	Brandt Mannchen	Sierra Club, Houston Regional Group
July 28	Craig Nisbett, P.E.	City of Lake Jackson
August 8	Barbara Swartz	League of Women Voters
August 8	Kathleen Kain	Cy-Fair Area Democrats Club
August 11	Sarah Metzger	Self
August 11	Tamara Shelby	Self
August 12	Brandt Mannchen	Sierra Club, Houston Regional Group
August 22	Jim McAlister	City of Willis
August 28	James H. F. Williams	Self
September 9	Jerry Lovelady	Porter Special Utility District
September 13	Mary Ellen	Whitworth Bayou Preservation Association
September 13	John Baker	Brazos River Authority
September 15	Brandt Mannchen	Sierra Club, Houston Regional Group
September 16	Myron Hess	National Wildlife Federation
	Mary Kelly	Environmental Defense Fund
	Ken Kramer	Sierra Club, Lone Star Chapter
Comments Received from the State Agencies		
September 14	Larry D. McKinney	Texas Parks & Wildlife Department
September 28	William Millican	Texas Water Development Board
Comments Received after September 16, 2005		
September 21	Kirby L. Brown	Texas Wildlife Association
October 7	Brandt Mannchen	Sierra Club, Houston Regional Group

10.7.4 Responses to Public Comments Received

All of those submitting comments who provided address information will receive a letter of response thanking them for taking the time to review the Initially Prepared Regional Water Plan and provide comments. The letter will encourage their continued participation in the ongoing planning process. Responses to their specific concerns are set out below. Comments and responses are organized by public hearing site, followed by written comments received and responses to written comments.

A. December 2002 Public Meetings

1. Public Notice

2. Slide Presentation

3. Written Comments and Responses

A. December 2002 Public Meetings

1. Public Notice

2. Slide Presentation

3. Written Comments and Responses

REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-1111 Facsimile 936-588-3043

Public Meeting
To Review Population Projections for Use in Updated Regional Water Plan

The Region H Water Planning Group will hold two public meetings to discuss draft Population Projections. The Projections were prepared by the Texas Water Development Board and will be used in updating the 2001 Regional Water Plan pursuant to Senate Bill 2 of the 77th Legislative Session and Texas Water Code §16.053. The updated Regional Water Plan will be submitted to the TWDB in 2005. The TWDB will consolidate the reports from the 16 Regional Water Planning Areas and report to the Texas Legislature in January 2007

Region H is a 15 county area including Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Leon, Liberty, Madison, Montgomery, Polk (part), San Jacinto, Trinity (part), Walker and Waller counties. The public meetings will be held:

December 5, 2002, 7:00 p.m.
E. B. Cape Training Center, 4501 Leeland, Houston, Texas 77023

December 10, 2002, 7:00 p.m.
Montgomery County Memorial Library, 104 I-45 North, Conroe, Texas 77301

The draft Population Projections are available on the Texas Water Development Board (TWDB) website at www.twdb.state.tx.us/data/popwaterdemand/draftpopulation.pdf. Requests for amendments to the projections must be accompanied by supporting documentation as required by TWDB. For additional information on the meetings, please call Glenda Callaway at 713-520-9031.

Requests for amendments to the draft Population Projections, together with required supporting documentation, may be made in writing by submitting them to the RHWPG Chairman, Mr. Jim Adams, General Manager, SJRA, P.O. Box 329, Conroe, Texas 77305-0329 by December 20, 2002.

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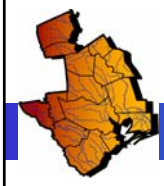

Region H
Water Planning Group

PUBLIC MEETING
for
REGION H
DRAFT POPULATION ESTIMATES

December 5 & 10, 2002

Kellogg Brown & Root / Turner, Collie & Braden Joint Venture
LBG-Guyton
Ekistics Corporation

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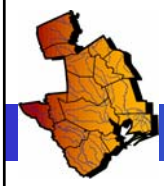

Region H
Water Planning Group

Agenda

- Regional Water Planning Overview
- Population Estimates
- How to Submit Revisions and Corrections
- Comments and Questions

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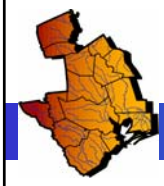

Region H
Water Planning Group

What is Regional Water Planning?

- A cyclic, deliberate planning process instituted under Senate Bill 1 of the 75th Texas State Legislature (1997).
- Water demands and supplies are evaluated at a regional level to ensure adequate supply throughout a 50-year planning period.
- Regional water plans are updated every 5 years. The first plan was published in January 2001.

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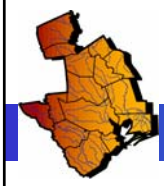

Region H
Water Planning Group

Why is Regional Water Planning Important?

- Water treatment and transmission systems take time and major public investment to finance and construct.
- New water supplies often require significant public input and involvement before they can be developed.
- Local projects must be included in the regional water plans if funding assistance is requested from the Texas Water Development Board.

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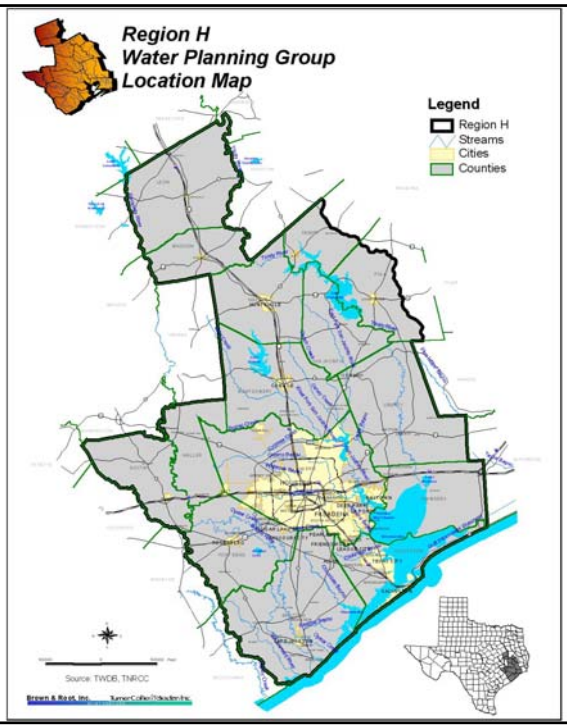
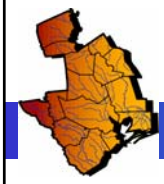


Where is Region H?

- **15 Counties**
- **3 River Basins**
- **Encompasses Galveston Bay and Sam Houston National Forest**



Region H
Water Planning Group

Who is Region H?

- Region H Water Planning Group is made up of representatives from the General Public, City and County Government, Industry, Agriculture, Environmental Groups, Small Business, Electric Generating Utilities, River Authorities, Water Districts and Water Utilities
- RHWPG Chairman is Jim Adams, General Manager of the San Jacinto River Authority

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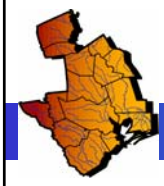

Region H
Water Planning Group

Regional Planning Process

- Population projections are made by decade through 2060 based on the 2000 U.S. Census
- Water demands are projected based on current water use and projected population growth.
- Water supply is evaluated using the latest water availability models developed by the Texas Commission on Environmental Quality and the Texas Water Development Board.
- Shortages are addressed through management strategies, which range from renewing expiring contracts to constructing new reservoirs.

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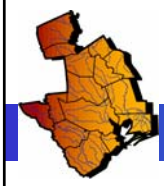

Region H
Water Planning Group

Regional Planning Timeline / Milestones

- Population estimates due to TWDB: January 2003
- Water demand projections due to TWDB: June 2003
- Water Availability Models published: Fall 2002
- Groundwater Availability Models published: Fall 2003
- Initially Prepared (Draft) Regional Water Plans published for comment: June 2005
- Final Regional Water Plans published: January 2006

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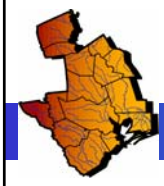

Region H
Water Planning Group

Population Projections

- TWDB Population methodology
  - Cohort survival method
  - Inward or outward migration
  - Based only on population and historic rates
- Very accurate statewide, and regionally
- Reasonably accurate at county level
- Less accurate at local level

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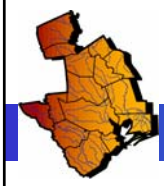

Region H
Water Planning Group

Population Projections

County Name	Planning Phase	Decadal Population						
		2000	2010	2020	2030	2040	2050	2060
Austin	SB 1	23,571	26,639	30,362	34,161	38,200	42,980	-
	SB2	**23,590**	**27,173**	**30,574**	**32,946**	**34,355**	**35,031**	**35,958**
Brazoria	SB 1	241,233	279,519	322,819	378,774	424,518	489,838	-
	SB2	**241,767**	**285,850**	**331,731**	**375,664**	**416,157**	**459,078**	**503,894**
Chambers	SB 1	27,943	35,180	44,395	50,154	54,561	57,719	-
	SB2	**26,031**	**31,375**	**37,328**	**42,867**	**47,667**	**52,535**	**57,521**
Fort Bend	SB 1	372,666	505,935	683,080	914,290	1,147,629	1,399,774	-
	SB2	**354,452**	**490,072**	**630,624**	**802,486**	**979,196**	**1,210,945**	**1,475,761**
Galveston	SB 1	259,656	300,009	349,260	399,936	434,319	456,631	-
	SB2	**250,158**	**268,714**	**284,731**	**294,218**	**298,057**	**300,915**	**302,774**

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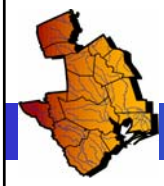

Region H
Water Planning Group

Population Projections

County Name	Planning Phase	Decadal Population						
		2000	2010	2020	2030	2040	2050	2060
Harris	SB 1	3,303,757	3,809,510	4,434,344	4,796,682	5,249,691	5,543,482	-
	SB2	**3,400,578**	**3,951,682**	**4,502,786**	**5,053,890**	**5,604,994**	**6,156,098**	**6,707,202**
Leon	SB 1	14,879	16,737	18,664	20,423	22,308	24,108	-
	SB2	**15,335**	**18,231**	**21,137**	**22,863**	**22,971**	**22,809**	**23,028**
Liberty	SB 1	69,124	77,625	104,156	141,589	153,963	167,415	-
	SB2	**70,154**	**81,930**	**94,898**	**107,335**	**119,519**	**132,875**	**147,845**
Madison	SB 1	12,673	13,048	13,203	13,049	12,612	11,914	-
	SB2	**12,940**	**13,905**	**14,873**	**15,644**	**16,364**	**17,002**	**17,560**
Montgomery	SB 1	295,403	439,173	602,374	818,084	989,264	1,162,046	-
	SB2	**293,768**	**417,692**	**542,051**	**692,548**	**858,410**	**1,077,190**	**1,331,286**

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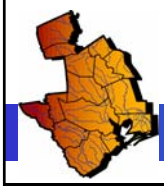

Region H
Water Planning Group

Population Projections

County Name	Planning Phase	Decadal Population						
		2000	2010	2020	2030	2040	2050	2060
Polk	SB 1	33,196	37,057	41,706	46,952	51,040	54,731	-
	SB2	**33,098**	**37,650**	**42,196**	**45,779**	**48,561**	**51,535**	**54,380**
San Jacinto	SB 1	21,806	27,018	32,118	36,637	41,012	45,872	-
	SB2	**22,246**	**27,443**	**32,541**	**36,617**	**39,159**	**40,630**	**41,299**
Trinity	SB 1	10,673	11,174	11,550	11,949	12,504	13,304	-
	SB2	**10,380**	**11,571**	**12,485**	**12,786**	**12,631**	**12,131**	**11,673**
Walker	SB 1	62,592	71,217	78,895	89,676	96,974	101,675	-
	SB2	**61,758**	**70,672**	**77,915**	**81,402**	**80,547**	**80,737**	**80,737**
Waller	SB 1	30,912	42,606	63,870	94,028	109,453	128,788	-
	SB2	**32,663**	**41,137**	**51,175**	**62,352**	**74,789**	**89,598**	**106,608**

County Name	Planning Phase	Decadal Population						
		2000	2010	2020	2030	2040	2050	2060
Region H Total	SB 1	4,780,084	5,692,447	6,830,796	7,846,384	8,838,048	9,700,277	-
	SB2	**4,848,918**	**5,775,097**	**6,707,045**	**7,679,397**	**8,653,377**	**9,739,109**	**10,897,526**
Region H Change	*(SB2 - SB1)*	*68,834*	*82,650*	*-123,751*	*-166,987*	*-184,671*	*38,832*	-

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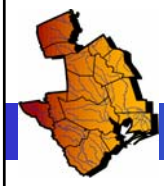

Region H
Water Planning Group

How to Submit Corrections

- To cap projected growth for your city or district you must provide
  - Boundary of current service area
  - Estimated capita per connection
  - Estimated number of connections at buildout.
  - Estimated year buildout occurs
  - Statement of intent

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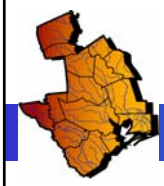


Region H
Water Planning Group

How to Submit Requests for Corrections (cont.)

- To increase or otherwise adjust the projections, you must meet the following:
  - Higher growth rate experienced
  - Areas have been annexed or service area expanded
- Data Requirements
  - Year 2002 population by State Data Center
  - 2000 census population and connections
  - Ultimate projections based on buildout
  - Population of annexed areas

5/20/2005 10:14 AM

Region H
Water Planning Group

- Submit requests for corrections to:

  Jim Adams, P.E., Chairman
  Region H Water Planning Group
  P.O. Box 329, Conroe, Tx, 77305-0329

- Deadline: December 20, 2002

5/20/2005 10:14 AM

Region H
Water Planning Group

Comments and Questions

5/20/2005 10:14 AM

SIERRA CLUB

Houston Regional Group
P.O. Box 3021
Houston, Texas 77253-3021
713/895-9309

December 15, 2002

Mr. Jim Adams
Chair
Region H Water Planning Group
General Manager
San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305-0329

Dear Jim,

Enclosed are the comments of the Houston Sierra Club (HSC) regarding the review of population projections for use in the updated regional water plan for Region H.

We protest the short timeframe that Region H is giving the public to comment on this document. The public notice we saw was published in the Houston Chronicle on December 1, 2002. The deadline for written comments is December 20, 2002. The public hearings were held on December 5, 2002 and December 10, 2002, only 4 days and 9 days after the public notice was published. The documents were only available, to our knowledge on the internet. The 50% of the public without computers would have a difficult time accessing the information.

During the December 10, 2002 public meeting I was told the population projections had been on a website for six months. I was never notified about the availability of this document. How can the public keep up-to-date on public documents and be prepared to comment when they are not notified of the existence of such documents? It seems as if only select members of the public find out about such documents (like cities and counties and water entities) because they are involved with the Region H process. Others are ignorant who would like to know about these things.

A copy of a letter I sent to you on September 30, 2001 is enclosed. This letter requested that I be placed on the mailing list for the Houston Sierra Club to receive a copy of the Region H Water Planning Group newsletter. This letter also requested that I be notified of any meetings of the Region H Water Planning Group (RHWPG). This letter also requested that I be sent copies of the agenda and minutes of the RHWPG meetings when they became available. I have not been sent this information in 2002. I have moved since September 30, 2001 but I am still receiving mail that is being forwarded from my old address. It appears that this information is not being sent to me. I again request that you send me this information each time it is available. I also request that you send me all of this

information for 2002 so that I am up-to-date on what events transpired that involve the RHWPG.

The HSC is very concerned that the RHWPG, the TWDB, and the State Legislature are putting the cart before the horse regarding population projections. Instead of having a public debate about what population the State of Texas would like to have in 2050 instead we are being asked to plan for a population that roughly grows at the present rate which means that Texas will double its population to 40 million.

Population projections are the very foundation of all planning in Texas. But we do not know what Texans want. We are not even asking what Texans want. We are not telling Texans what doubling the population will mean for them, their children, and grandchildren regarding air quality, water quality, noise, light pollution, traffic congestion, green space and parks, farmland, social services, quality of life, etc. We just ignore the impacts and assume a doubling of population. Water demands are based on implementing a plant that has not policy decision about what population growth we want.

By not conducting the public policy debate RHWPG, et. al., ensure that we will build for 40 million people and that we will, in all probability, have 40 million people in 2050. By conducting water planning this way RHWPG, et. al., implement the fallacy that "Trend is Destiny." We are not preordained to have a continuing growth in population. Only if we decide, either implicitly or by default (which still constitutes a public policy decision,

There are many public policy questions that must be answered before population projections are made. Some of these include:

1) What population do we want?
2) What population can we handle (so we do not exceed natural carrying capacities)?
3) Is growth in population good or bad?
4) Do we need growth in population?
5) Why do we need growth in population?
6) How much population growth should we have?
7) What quality of population growth do we want?
8) What can we do to reduce population growth?
9) Why don't we reduce population growth?
10) How much immigration is good?
11) How much immigration is bad?
12) How can we control population growth?
13) How can we implement birth control, sex education, and family planning?
14) What level of economic growth do we want?
15) What level of economic growth do we need?

Without conducting a public policy debate on these and other questions first, the population projections presented are a **fait acompli** and the public is not being allowed a fair opportunity to voice what it wants. This was made clear at the December 10, 2002 public hearing. Contractors stated that the population projections can only be altered if

there is real demographic, statistical, or other information which would call into question the population projections. I stated that it appeared that the way the population projections were being presented to the public was that only if I represented a county, municipality, or other governmental entity would I be able to provide data that would alter the projections. They agreed that this was the case.

These population projections also do not take into account how growth trends can alter what the projections say. For instance the trend (and policy issue) of moving into rural areas is not reflected in the population projections in several counties that are outer-lying to Harris County (Trinity County being an example). The trend (and policy issue) of companies moving out of the more urban or populated areas and taking jobs with them to more rural areas is also not addressed in the population projections. Do we want to encourage these trends or not? Why are we not debating these public policy issues before projecting population? The public is in fact locked out of the process that determines growth and population growth.

It seems obvious that the long planning timeframe for water projects will cause projects to be built on speculation. This speculation in population growth and water use will then become fact. The fact that there are existing inter-basin water transfers between the San Jacinto, Brazos, and Trinity Rivers does not mean that we should continue this strategy. It is the HSC contention that when a population seeks water outside of the watershed it lives in then it has already exceeded the carrying capacity of that watershed and that population is already greater than it should be.

We object to the RHWPG seeking legislative approval to eliminate junior water rights. Why should profligate water users and population attractors take the water rights from others because they have not taken the responsibility to reduce their water use or population to fit the water they have that can be used? We believe seeking the elimination of junior water rights in Region H is the start of the unraveling of this issue throughout the State. The powerful haves will ensure that those who are not as powerful will suffer and must be burdened with the responsibility that the haves do not with to carry. This is not fair or right.

The human population carrying capacity of each river basin needs to be determined, taking into account protecting sensitive areas and ecosystem needs, and then we need to plan so we do not exceed this population projection. This should be the goal of every water plan. We need a full, public, debate to ensure that we get it right. By getting it wrong we ensure that we will degrade the environment that we rely on for all of our needs which means we will degrade our quality of life and reduce the carrying capacity for humans. We bring ourselves closer to ecological overshoot or collapse by not recognizing that humans are animals too and we are dependent on the same ecological principles as every other living organism. We cannot avoid the bullet.

With regard to the Guidelines and Data Requirements for Addressing Revisions of the Consensus-Based Population and Water Demand Projections, we question whether residential and commercial water use should be combined together into municipal water

use. The ways to approach reducing both of these water uses are different and cannot be considered best together and the growth trends can also be different. For instance, many individuals will reduce water use based on what this means for their family in the future or economics. Commercial water users will reduce water use based mostly on economics. Altruism plays a smaller role in what motivates these people when a water use education program is created.

In the guidelines another criteria that should be used is that the construction of larger water systems attracts more population growth and water use than smaller systems. That is because the bigger systems have more excess water capacity and water which can accommodate more growth. Such systems should not be given points because they can serve more people. The focus should be on systems that do not have excess capacity and provide room for more excess growth. Otherwise you feed the growth machine and defeat your ability to get ahead of population growth and provide capacity for severe droughts.

In the guidelines it appears to us that livestock water use and agricultural water use will drop since agriculture will decrease over time. This guidance should be change to reflect this reality.

We request a copy of any **other criteria** that Region H is using for livestock water, use, agriculture water use, industrial water use, municipal water use, and population projections other than those contained in the guidelines.

We are concerned that the **"recommended most likely scenario"** will be used as the **"primary basis for planning"** as stated by Volume III, Water Use Planning Data Appendix, in Water for Texas – Today and Tomorrow a 1996 Consensus-Based Update to the Texas Water Plan. This ensures that the policy debate does not occur and the real policy is based on the population projections that have not been truth-tested by public debate on what population growth Texans want. For instance, the Forecasting Methodology and Key Planning Assumption are based on fertility rates, survival rates, and migrations which all can be altered. We need to decide what we want within each of these three categories and then plan how we will achieve these goals.

The so-called key assumptions in Volume III are based on a policy decision to do nothing and accept whatever growth occurs that is induced by other policies of the State of Texas. What is the point of planning if this is all we are going to do?

We do not agree with the assumption in Volume III that **"power generation demands will grow in direct proportion to population growth."** This one assumption ignores the importance of energy conservation and reduce in waste and increases in energy efficiencies.

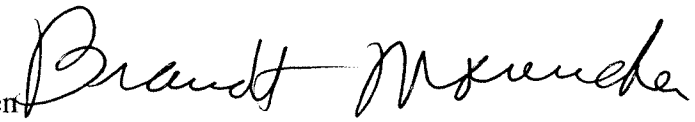
We are particularly concerned about the impacts that these population projections and associated water use will have on Sam Houston National Forest and other sensitive ecological and wildlife areas. We are concerned that shallow-water aquifers will dry us

that unique, seep, spring, moisture-loving, and stream-based plant and animal communities will suffer or be destroyed. There is no recognition in these population projections about what they will mean, in terms of impacts, to Sam Houston National Forest and other private and public protected or ecologically sensitive areas. Without giving the public this information how can the public agree or disagree with any population projections.

We request that the population projections be withdrawn and that the public policy issues of population growth and economic growth, including the loss of natural landscapes and the altering of sensitive ecological areas be debated and decided first before making population projections and then building water projects to meet these projections. All of the questions in this letter need to be answered first before we agree to population projections that will irretrievably and irreversibly alter our natural resources that we depend on for survival.

We appreciate this opportunity to comment. Thank you.

Sincerely,



Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
Lone Star Chapter
5431 Carew
Houston, Texas 77096
H713-664-5962, W713-640-4313

SIERRA CLUB

Houston Regional Group
P.O. Box 3021
Houston, Texas 77253-3021
713/895-9309

September 30, 2001

Mr. Jim Adams, P.E.
San Jacinto River Authority
P. O. Box 329
Conroe, Texas 77305-0329

Dear Jim,

On behalf of the Houston Sierra Club I am requesting that I be placed on the mailing list to receive the Region H Water Planning Group newsletter whenever it is published. Please use the address that is found at the end of this letter. I also request that I be notified of all meetings for Region H. I also request a copy of the agenda and minutes of the Region H meetings when they are available.

I appreciate your help with this request. Thank you.

Sincerely,

Brandt Mannchen

Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
Lone Star Chapter
5115 Maple
Bellaire, Texas 77401
H713-664-5962, W713-640-4313

B. March 2003 Public Meetings

1. Public Notice

2. Slide Presentation

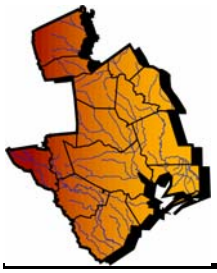
3. Written Comments and Responses

B. March 2003 Public Meetings

1. Public Notice

2. Slide Presentation

3. Written Comments and Responses



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-1111 Facsimile 936-588-3043

Public Meeting
To Review Water Demand Projections for Use in Updated Regional Water Plan

The Region H Water Planning Group will discuss draft Water Demand Projections at four public meetings. The Projections were prepared by the Texas Water Development Board and will be used in updating the 2001 Regional Water Plan pursuant to Senate Bill 2 of the 77th Legislative Session and Texas Water Code §16.053. The updated Regional Water Plan will be submitted to the TWDB in 2005. The TWDB will consolidate the reports from the 16 Regional Water Planning Areas and report to the Legislature in January 2007

Region H is a 15 county area including Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Leon, Liberty, Madison, Montgomery, Polk (part), San Jacinto, Trinity (part), Walker and Waller counties. The public meetings will be held:

March 5, 2003, 10:00 a.m. - SJRA Offices, Lake Conroe Dam, Damsite Road, Conroe (in conjunction with regular RHWPG meeting)
March 17, 2003, 7:00 p.m. - San Jacinto College South, Room 221,13735 Beamer Road, Houston
March 18, 2003, 1:30 p.m. - Houston-Galveston Area Council, 3555 Timmons, Houston
March 20, 2003, 7:00 p.m. - Walker County Courthouse,1100 University, Room 302, Huntsville

The draft Water Demand Projections for each water user group in the Region are available on the Texas Water Development Board (TWDB) website at *www.twdb.state.tx.us*. Requests for amendments to the projections must be accompanied by supporting documentation as required by TWDB. For additional information on the meetings, please call Glenda Callaway at 713-520-9031.

Requests for amendments to the draft Projections, together with required supporting documentation, may be made in writing by submitting them to the RHWPG Chairman, Mr. Jim Adams, General Manager, SJRA, P.O. Box 329, Conroe, Texas 77305-0329 by April 11, 2003.

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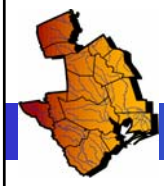

Region H
Water Planning Group

Region H
2006 Water Planning Process

Water Demand Public Meeting
March 5, 2003

Kellogg Brown & Root / Turner, Collie & Braden Joint Venture

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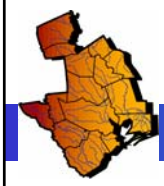

Region H
Water Planning Group

Agenda

- Regional Water Planning Overview
- Population Projections
- Wholesale Water Providers
- Initial Water Demand Projections
- How to Submit Revisions and Corrections
- Comments and Questions

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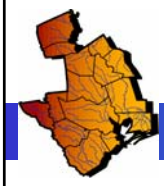

Region H
Water Planning Group

What is Regional Water Planning?

- A cyclic, deliberate planning process instituted under Senate Bill 1 of the 75th Texas State Legislature (1997).
- Water demands and supplies are evaluated at a regional level to ensure adequate supply throughout a 50-year planning period.
- Regional water plans are updated every 5 years. The first plan was published in January 2001.

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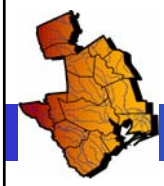

Region H
Water Planning Group

Why is Regional Water Planning Important?

- Water treatment and transmission systems take time and major public investment to finance and construct.
- New water supplies often require significant public input and involvement before they can be developed.
- Local projects must be included in the regional water plans if funding assistance is requested from the Texas Water Development Board.

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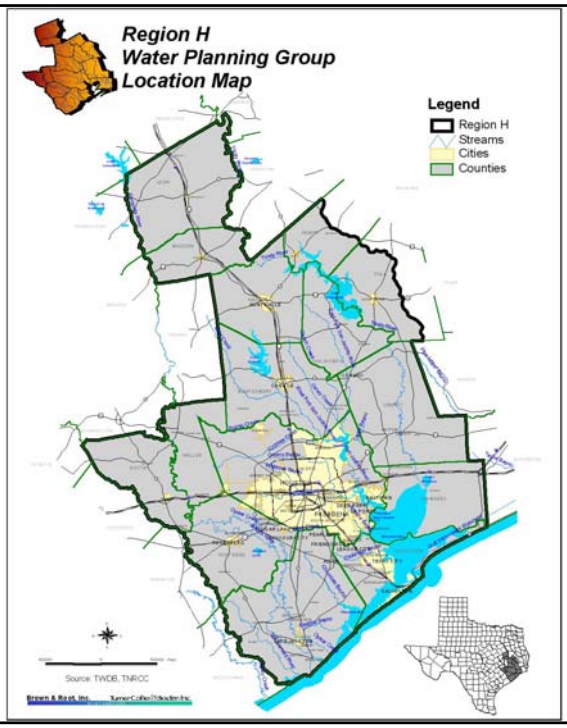
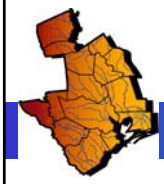


Where is Region H?

- **15 Counties**
- **3 River Basins**
- **Encompasses Galveston Bay and Sam Houston National Forest**



Region H
Water Planning Group

Who is Region H?

- Region H Water Planning Group is made up of representatives from the General Public, City and County Government, Industry, Agriculture, Environmental Groups, Small Business, Electric Generating Utilities, River Authorities, Water Districts and Water Utilities
- RHWPG Chairman is Jim Adams, General Manager of the San Jacinto River Authority

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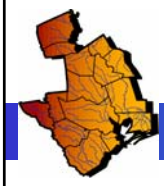

Region H
Water Planning Group

Regional Planning Process

- Population projections are made by decade through 2060 based on the 2000 U.S. Census
- Water demands are projected based on current water use and projected population growth.
- Water supply is evaluated using the latest water availability models developed by the Texas Commission on Environmental Quality and the Texas Water Development Board.
- Shortages are addressed through management strategies, which range from renewing expiring contracts to constructing new reservoirs.

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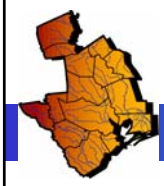

Region H
Water Planning Group

Regional Planning Timeline / Milestones

- Population estimates submitted to TWDB: January 2003
- Water demand projections due to TWDB: June 2003
- Water Availability Models published: Fall 2002
- Groundwater Availability Models published: Fall 2003
- Initially Prepared (Draft) Regional Water Plans published for comment: June 2005
- Final Regional Water Plans published: January 2006

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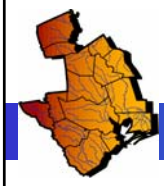

Region H
Water Planning Group

Population Projections

- 2000 Census for Region H totaled 4,848,918
- 2001 Regional Water Plan estimated the 2000 population as 4,780,084 (based on the 1990 census)
- Region is projected to grow to 10,897,526 by 2060 (projected from 2000 census)
- Population was calculated for municipalities over 500-persons and retail water providers over 0.25 mgd

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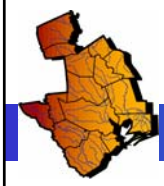

Region H
Water Planning Group

County Population Projections

County Name	P1990	P2000	P2010	P2020	P2030	P2040	P2050	P2060
AUSTIN	19,832	23,590	27,173	30,574	32,946	34,355	35,031	35,958
BRAZORIA	191,707	241,767	285,850	331,731	375,664	416,157	459,078	503,894
CHAMBERS	20,088	26,031	31,375	37,328	42,867	47,667	52,535	57,521
FORT BEND	225,421	354,452	490,072	630,624	802,486	979,196	1,210,945	1,475,761
GALVESTON	217,399	250,158	268,714	284,731	294,218	298,057	300,915	302,774
HARRIS	2,818,199	3,400,578	3,951,682	4,502,786	5,053,890	5,604,994	6,156,098	6,707,202
LEON	12,665	15,335	18,231	21,137	22,863	22,971	22,809	23,028
LIBERTY	52,726	70,154	81,930	94,898	107,335	119,519	132,875	147,845
MADISON	10,931	12,940	13,905	14,873	15,644	16,364	17,002	17,560
MONTGOMERY	182,201	293,768	417,692	542,051	692,548	858,410	1,077,190	1,331,286
POLK	22,369	33,098	37,650	42,196	45,779	48,561	51,535	54,380
SAN JACINTO	16,372	22,246	27,443	32,541	36,617	39,159	40,630	41,299
TRINITY	7,666	10,380	11,571	12,485	12,786	12,631	12,131	11,673
WALKER	50,917	61,758	70,672	77,915	81,402	80,547	80,737	80,737
WALLER	23,390	32,663	41,137	51,175	62,352	74,789	89,598	106,608
	3,871,883	**4,848,918**	**5,775,097**	**6,707,045**	**7,679,397**	**8,653,377**	**9,739,109**	**10,897,526**

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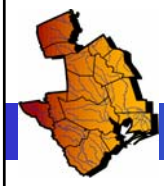

Region H
Water Planning Group

Wholesale Water Providers

- A wholesale water provider is any person or entity that has contracts to sell more then 1,000 acre-feet of water (approx 1 mgd) wholesale in any one year during the five years immediately preceding the adoption of the last Regional Water Plan.
- 8 industrial facilities in region H may qualify as Wholesale Water Providers
- Wholesale Water Providers will be specifically addressed in the Regional Water Plan

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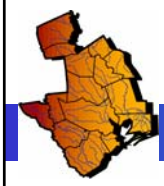
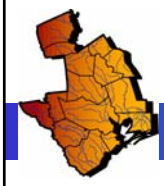


Region H
Water Planning Group

Wholesale Water Providers List

AIR LIQUIDE AMERICA, CORP.	CITY OF PASADENA
BAYTOWN AREA WATER AUTHORITY	CLEAR LAKE CITY WATER AUTHORITY
BP PRODUCTS NORTH AMERICA, INC	FORT BEND CO M.U.D. #112
BRAZORIA CO. MUD NO. 2	FORT BEND CO. WCID 1
BRAZOS RIVER AUTHORITY	FORT BEND UTILITIES CO.
BRAZOSPORT WATER AUTHORITY	GULF COAST WATER AUTHORITY
CHEVRON PHILLIPS CHEMICAL CO L.P	HARRIS CO MUD #358
CHOCOLATE BAYOU WATER CO.	LA PORTE AREA WATER AUTHORITY
CINCO MUD NO 1	LYONDELL-CITGO REFINING LP
CITY OF BAYTOWN	OXYVINYLS, LP
CITY OF CONROE	SAN JACINTO RIVER AUTHORITY
CITY OF FREEPORT	SYNGENTA CROP PROTECTION
CITY OF GALVESTON	TEXAS PETROCHEMICALS LP.
CITY OF HOUSTON	THE DOW CHEMICAL CO.
CITY OF HUNTSVILLE	TRINITY RIVER AUTHORITY



Region H
Water Planning Group

Water Demand Projections

- All projections are based on Year 2000 water use (considered a drought year for the State)
- Municipal demands are based on calculated per capita and expected water conservation
- Manufacturing, mining and power demands are based on usage reported in the TWDB 2000 Use Survey
- Irrigation and livestock watering are based on Year 2000 data from the Natural Resource Conservation Service.

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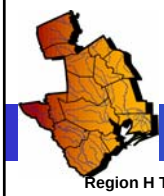

Region H
Water Planning Group

Water Demand Projections

Region H Total	2000	2010	2020	2030	2040	2050	2060
2006 Projection							
Municipal (revised)	**839,996**	**969,054**	**1,105,902**	**1,243,333**	**1,382,026**	**1,543,325**	**1,724,254**
Irrigation	260,495	251,125	243,235	240,210	238,386	238,386	238,386
Livestock	12,228	12,228	12,228	12,228	12,228	12,228	12,228
Manufacturing	517,162	592,873	640,689	681,818	720,146	750,975	760,654
Mining	49,473	57,043	60,782	63,053	65,285	67,501	69,457
Electric Power	83,262	91,231	112,334	131,332	154,491	182,720	217,132
Total	**1,762,279**	**1,972,915**	**2,172,201**	**2,366,482**	**2,565,025**	**2,785,198**	**3,008,653**
2001 Plan							
Municipal	897,209	1,006,520	1,139,092	1,263,939	1,367,342	1,485,639	
Irrigation	501,053	488,604	478,122	474,102	471,679	471,679	
Livestock	13,038	13,038	13,038	13,038	13,038	13,038	
Manufacturing	708,113	780,189	830,287	874,028	961,475	1,048,194	
Mining	33,826	30,131	29,951	31,242	32,852	35,243	
Electric Power	95,100	96,100	98,600	101,100	101,500	105,000	
Total	**2,248,339**	**2,414,582**	**2,589,090**	**2,757,449**	**2,947,886**	**3,158,793**	

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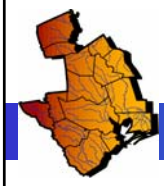
Values in acre-feet/year



Region H
Water Planning Group

How to Submit Corrections

- Municipal use projections can be adjusted if:
  - 2000 Census population is revised
  - Errors are identified in water use reporting
  - Year 2000 water use was abnormal
  - Per capita use 95 through 99 more normal
  - Trends show higher use that will continue
  - Fixture Installation data shows different trend

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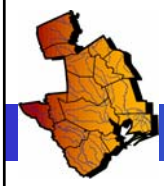

Region H
Water Planning Group

How to Submit Requests for Corrections (cont.)

- Data needs for justifying changes:
  - Annual municipal production and any water purchased
  - Volumes of water sales to others
  - Net municipal usage measured in acre/feet per year
  - Documentation of any temporary constraints
  - Number of water efficient fixtures installed

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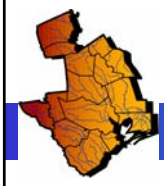

Region H
Water Planning Group

How to Submit Requests for Corrections (cont.)

- Data needs for justifying changes(cont.):
  - To justify increasing per capita usage, must
    - Have historical use from 1990
    - Account for rainfall
    - Show data from residential, commercial or public sectors to justify increased usage
  - Other data the Planning Group approves

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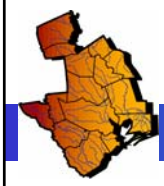

Region H
Water Planning Group

How to Submit Corrections

- Industrial use projections (manufacturing, mining, power generation) can be adjusted if:
  - An industrial facility was located in a county after the TWDB survey was conducted
  - An industrial facility recently closed operation in a county
  - There are plans to construct a new industrial facility in a county in the future

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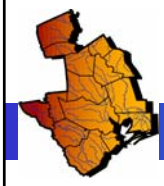

Region H
Water Planning Group

How to Submit Requests for Corrections (cont.)

- For new facilities to be added, the TWDB needs:
  - Annual water use for the facility, and
  - The North American Industrial Classification (NAIC) of the facility
- For future facilities to be added, the TWDB needs:
  - Confirmation that the land has been purchased or leased
  - The projected annual water use
  - The proposed construction schedule
  - NAIC for the facility

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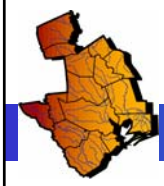

Region H
Water Planning Group

How to Submit Corrections

- Irrigation use projections can be adjusted if:
  - A year between 95 and 99 more valid
  - Use estimates for another source more accurate
  - Projected rates of change from 2002 plan no longer valid
- Data Requirements
  - Acreage and water use data
  - Economic, technical, or water shortage evidence

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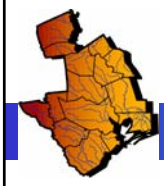

Region H
Water Planning Group

How to Submit Requests for Corrections (cont.)

- Livestock water Use can change if have:
  - Future plans for confined feeding operation
  - Evidence of change in livestock inventory/water requirements
- Data requirements:
  - Documentation of construction plans to include
    - Land purchase or lease arrangements
    - Construction schedule and completion date
    - Daily water requirements
  - Other Evidence

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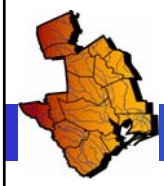


Region H
Water Planning Group

- Submit requests for corrections to:

  Jim Adams, P.E., Chairman
  Region H Water Planning Group
  P.O. Box 329, Conroe, Tx, 77305-0329

- Deadline: April 30, 2003
- Questions: mark.lowry@tcb.aecom.com
  greg.graml@halliburton.com

5/20/2005 10:15 AM


Region H
Water Planning Group
Comments and Questions
5/20/2005 10:15 AM

C. July Public Hearings

1. Public Notice

2. Slide Presentation

3 Written Comments and Responses

C. July Public Hearings

1. Public Notice

2. Slide Presentation

3 Written Comments and Responses

REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

TO:

- Each mayor of a municipality with a population of 1,000 or more or which is a county seat that is located in whole or in part in the Region H water planning area;
- Each county judge of a county located in whole or in part in the Region H water planning area;
- Each special or general law district or river authority with responsibility to manage or supply water in the Region H water planning area based upon lists of such water districts and river authorities obtained from Texas Commission on Environmental Quality;
- Each retail public utility, defined as a community water system, that serves any part of the Region H water planning area or receives water from the Region H water planning area based upon lists of such entities obtained from Texas Commission on Environmental Quality; and
- Each holder of record of a water right for the use of surface water the diversion of which occurs in the Region H water planning area based upon lists of such water rights holders obtained from Texas Commission on Environmental Quality.

RE: Public Notice of an *Initially Prepared 2006 Region H Water Plan* and *Proposed Amendment 1 to the 2001 Region H Water Plan*

DATE: June 8, 2005

PUBLIC NOTICE

To All Interested Parties:

The Region H Water Planning Group area includes all or part of the following counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Leon, Liberty, Madison, Montgomery, Polk, San Jacinto, Trinity, Walker, and Waller.

(1) Notice is hereby given that the Region H Water Planning Group (RHWPG) is requesting public review and comment on an Initially Prepared 2006 Region H Water Plan (the IPP).
(2) Notice is hereby given that the RHWPG is considering an amendment to the 2001 Region H Water Plan.

A summary of the content of the Draft Initially Prepared Plan: The *Initially Prepared Plan (IPP)* updates the 2001 Region H Water Plan that was included in the 2002 State Water Plan prepared by the Texas Water Development Board (TWDB). The IPP addresses the following topics:

- Water needs based on projected population and water demand
- Water supplies available to meet projected water demand
- Water management strategies for meeting any identified water shortages
- Socioeconomic impact of not addressing shortages
- Impacts of Management Strategies on Water Quality and Agricultural Areas
- Water Conservation and Drought Management
- Protection of Water Resources and Natural Resources

- Proposed Unique Stream Segments
- Proposed Unique Reservoir Sites
- Regulatory, Administrative and Legislative Recommendations

A summary of the proposed amendment to the 2001 Plan includes: The proposed action is to amend the 2001 *Region H Water Plan* to meet currently changed conditions. The proposed amendment being considered includes:

- Add water supply from the City of Houston as a water management strategy option for Utility Districts in eastern Fort Bend County.
- Add wastewater reuse, the permitting of additional yield in Lake Houston, and the permitting of unappropriated flows in the San Jacinto River as a water management strategy for the City of Houston and the San Jacinto River Authority.
- Add the permitting of interruptible supplies from Buffalo, Brays, Sims and White Oak Bayous as a water management strategy for the City of Houston.
- Add the redesignation of Chambers-Liberty Counties Navigation District supplies from irrigation use to mixed irrigation, municipal or manufacturing use as a water management strategy option for Chambers County.
- Add the permitting of additional supplies from the Brazos River System as a water management strategy for the Brazos River Authority.
- Add wastewater reuse as a water management strategy for the North Harris County Regional Water Authority.

Public Comment: Public hearings to receive public comment on the IPP and on proposed Amendment 1 to the 2001 Region H Water Plan will be held at the following dates and locations:

July 12, 10 a.m.
San Jacinto River Authority Office
105 Damsite Road
Conroe Texas 77305

July 14, 6:30 p.m.
Houston-Galveston Area Council
3555 Timmons, 2nd Floor, Room A
Houston, Texas 77027

The RHWPG will accept written comments until 5:00 p.m. September 16, 2005. Written comments should be provided to:

Jim Adams, PE
General Manager
San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305-0329

J. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

The RHWPG shall consider and vote upon the proposed Amendments 1 to the Region H Water Plan at its public meeting at 10:00 a.m. on October 5, 2005, to be held at the SJRA office, Conroe, Texas.

Questions or requests for additional information may be submitted to: Jim Adams, telephone number 936-588-7111, San Jacinto River Authority, P.O. Box 329, Conroe, TX 77305-0329. The San Jacinto River Authority is the Administrator for the RHWPG.

A copy of the Initially Prepared Plan for 2006 and the proposed Amendment 1 to the 2001 Regional Water Plan is available at the County Clerk's Office and at a depository library in each county in Region H. A list of depository libraries in attached**.** A copy also is available on the regional planning section of the TWDB website at www.twdb.state.tx.us.

DEPOSITORY LIBRARIES IN REGION H

AUSTIN COUNTY
Gordon Library
917 Circle Drive
Sealy, TX 77474

BRAZORIA COUNTY
Angleton Public Library
401 East Cedar
Angleton, TX 77515

CHAMBERS COUNTY
Chambers County Library
– Main Branch
202 Cummings
Anahuac, TX 77514

FORT BEND COUNTY
George Memorial Library
1001 Golfview
Richmond, TX 77469

GALVESTON COUNTY
Rosenberg Library
2310 Sealy
Galveston, TX 77550

HARRIS COUNTY
Houston Public Library
1st Floor, Bibliographic Information Center
500 McKinney
Houston, TX 77002

LEON COUNTY
Ward Memorial Library
129 East Main
Centerville, TX 75833

LIBERTY COUNTY
Sam Houston Regional Library
and Research Center
650 FM1011
Liberty, TX 77575

MADISON COUNTY
Madison County Library
605 South May
Madisonville, TX 77864

MONTGOMERY COUNTY
Montgomery County Central Library
104 Interstate 45 North
Conroe, TX 77301

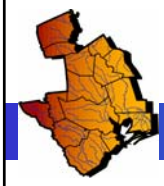
POLK COUNTY
Murphy Memorial Library
601 West Church
Livingston, TX 77351

SAN JACINTO COUNTY
Coldspring Library
220 South Bonham
Coldspring, TX 77331

TRINITY COUNTY
Blanche K. Werner Library
Highway 19 North
Trinity, TX 75862

WALKER COUNTY
Huntsville Public Library
1216 – 14th Street
Huntsville, TX 77340

WALLER COUNTY
Waller County Library -
Brookshire/Pattison
3815 Sixth Street
Brookshire, TX 77423



Region H
Water Planning Group

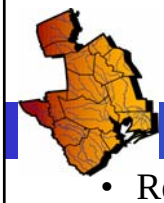
PUBLIC HEARING
for the
INITIALLY PREPARED
2006 REGION H WATER PLAN

Conducted at the

San Jacinto River Authority

July 12, 2005

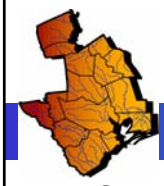
Kellogg Brown & Root / Turner, Collie & Braden Joint Venture
LBG-Guyton
Ekistics Corporation



Region H
Water Planning Group

Agenda

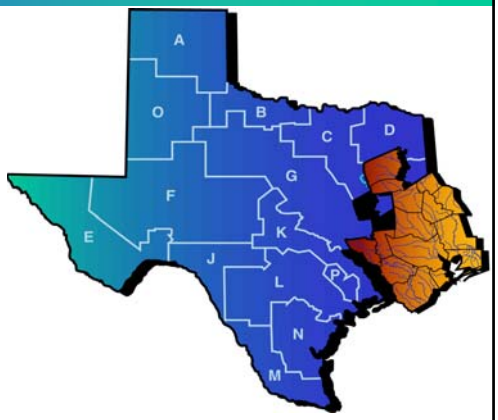
- Regional Water Planning
- Region H Overview
- Population and Water Demand Projections
- Water Supply Estimates
- Management Plan Strategies
- Impacts on Galveston Bay and Natural Resources
- Unique Stream Segments & Reservoirs
- Administrative, Regulatory and Legislative Recommendations
- Public Comment



Region H
Water Planning Group

Regional Water Planning

- SB1, 75th Legislature
- 16 planning regions
- Each region prepares a 50-year water plan, updated every 5 years
- The State Water Plan lags the Regional Plans by one year
- First plans published in 2001 & 2002



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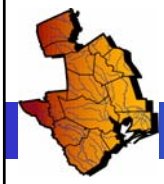

Region H
Water Planning Group

Region H Overview

- 15 Counties
- Approximately 13,000 sq mi.
- 18% of Texas Employment
- 4.8 million population, growing to 10.9 million by 2060
- 2.1 million af/y demand, growing to 3.4 million af/y in 2060
- 342 Water User Groups (WUG)
- 22 Wholesale Water Providers (WWP)

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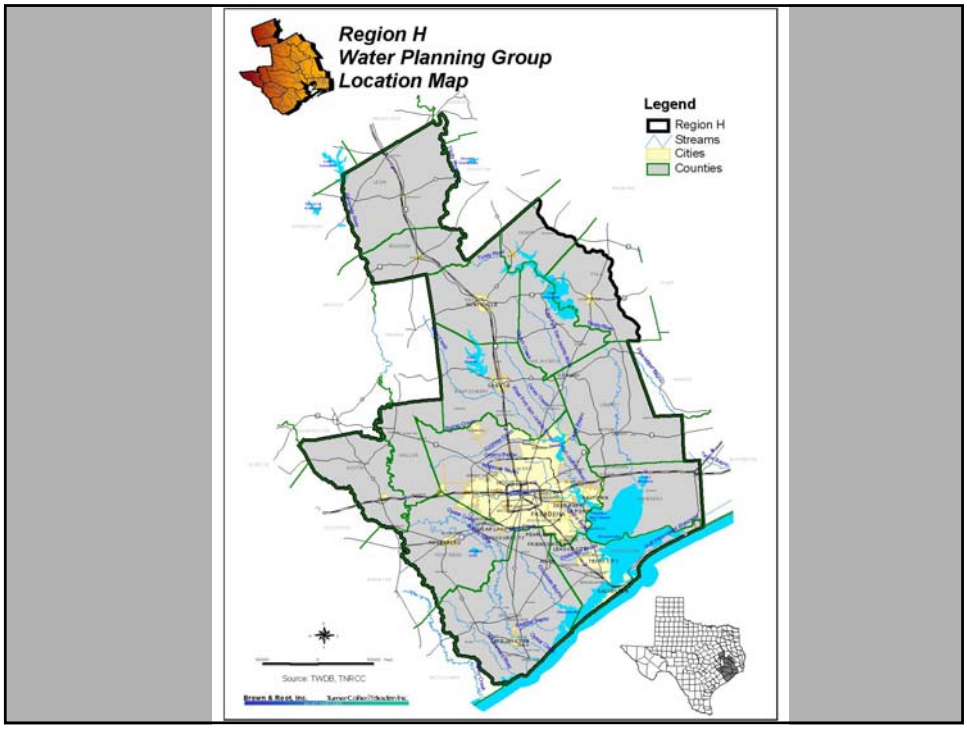

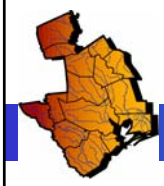

Region H
Water Planning Group

Region H
Water Planning Group

- Chaired by Jim Adams, SJRA
- 25 voting members representing:
  - Agriculture
  - Counties
  - Electric Generating Utilities
  - Environmental Groups
  - Industry
  - Municipalities
  - Public
  - River Authorities
  - Small Business
  - Water Districts
  - Water Utilities

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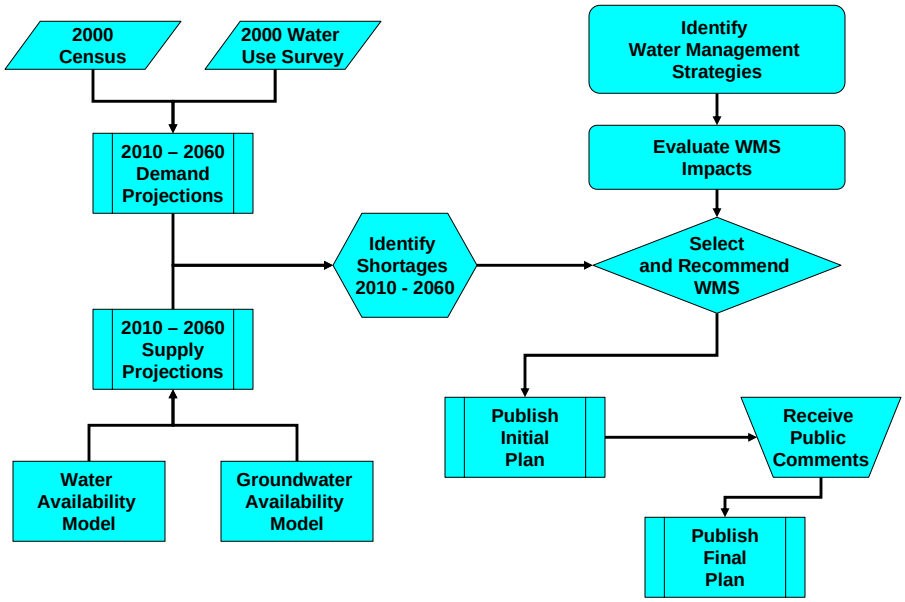
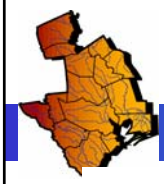
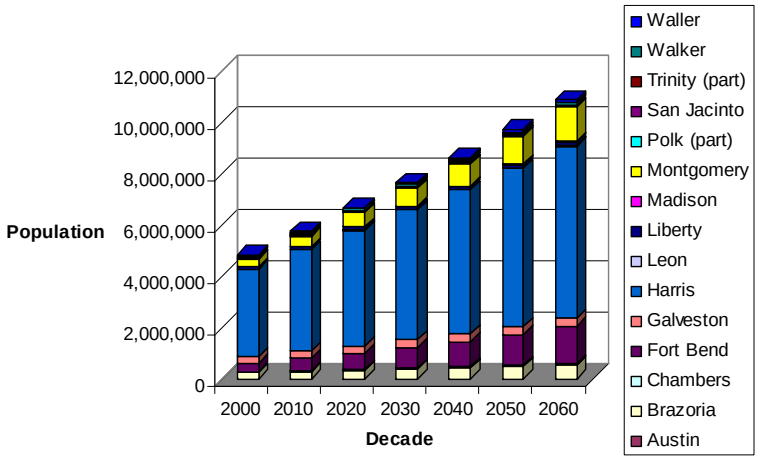
Planning Process



Projected Population Growth



Region H
Water Planning Group



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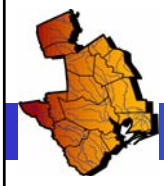
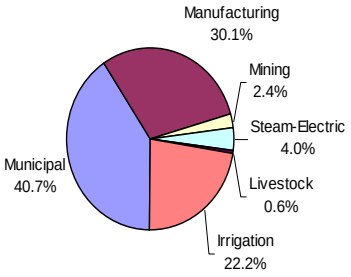
Texas Totals: 20.8 million in 2000 to 45.5 million in 2060



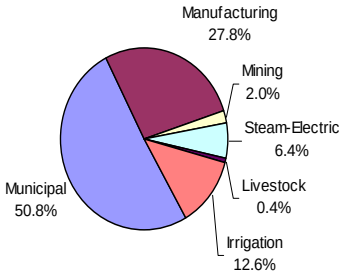
Region H
Water Planning Group

Projected Water Demand

Region H Demand by Usage Type
Year 2000
Total Demand 2.09 Million Acre-Feet



Region H Demand by Usage Type
Year 2060 Projection
Total Demand 3.41 Million Acre-Feet



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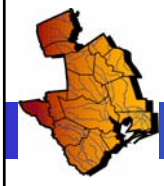
Texas Totals: 18.0 MAF in 2000 to 21.3 MAF in 2060



Region H
Water Planning Group

Existing Water Supplies

- Supplies determined by
  - WAM (during drought of record)
  - GAM or TWDB studies
- Total Amount (current) = 3,572,500 acre-feet per year
  - 75% surface water
  - 25% groundwater
- By year 2030, supply = 3,380,000 acre-feet per year
  - Groundwater use reduced by subsidence district regulations
  - Reservoir storage reduced by sedimentation

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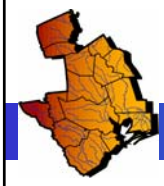

Region H
Water Planning Group

Water Demand versus Supplies

- 193 WUGs with shortages
  - 168 municipalities or water districts
  - 6 municipal county-other (aggregate unincorporated areas)
  - 19 non-municipal (aggregate manufacturing, mining, irrigation)
- Counties with the greatest shortages
  - Brazoria
  - Fort Bend
  - Harris
  - Montgomery
- 9 of the 22 WWPs will fully allocate their existing supplies

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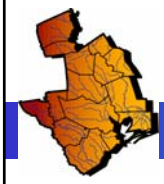

Region H
Water Planning Group

Recommended Water Management Strategies

- Municipal Conservation and Contract Extension/Increases solved 15 of the 93 shortages
- Major Strategies:
  - Water Conservation
  - System Operation of BRA/COE reservoirs
  - 2 off-channel reservoirs
  - 1 seawater desalination facility
  - 60 mgd direct wastewater reuse
  - 115 mgd indirect wastewater reuse

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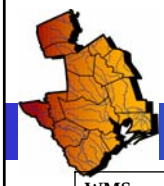

Region H
Water Planning Group

Recommended Water Management Strategies

WMS	Yield (ac-ft/yr)	Capital Cost	Starting Decade
Municipal Conservation*	101,200	$ 9,823,000	2000
Irrigation Conservation	77,900	$ 573,000	2010
Industrial Conservation	TBD	TBD	2000
Expanded Use of Groundwater**	91,497	at WUG level	2010
Expand/Increase Current Contracts	68,300	at WUG level	2010
New Contracts from Existing Supply	215,400	see Luce Bayou	2010
Luce Bayou IBT Conveyance	N/A	$ 239,000,000	2020
BRA System Operations Permit	120,000	TBD	2010
Allens Creek Reservoir	99,700	$ 170,040,000	2030
Little River Off-Channel Reservoir	32,100	$ 96,512,000	2050
Non-Municipal Contractual Transfers	21,000	at WUG level	2010
Wastewater Reuse for Industry	67,200	$ 234,158,000	2020
* Includes COH voluntary conservation. ** Future development of groundwater shown as available to each WUG			

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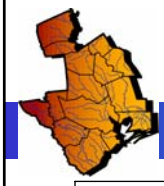

Region H
Water Planning Group

Recommended Water Management Strategies

WMS	Yield (ac-ft/yr)	Capital Cost	Starting Decade
TRA to Houston Contract	150,000	see Luce Bayou	2030
TRA to SJRA Contract	50,000	see Luce Bayou	2030
Houston to GCWA Transfer	28,000	$ 102,382,000	2050
Houston Indirect Wastewater Reuse***	98,000	TBD	2050
NHCRWA Indirect Wastewater Reuse***	31,400	TBD	2060
Lake Houston Additional Yield	13,500	$ 0	2010
Freeport Seawater Desalination	33,600	$ 255,699,000	2020
Brazos Saltwater Barrier	N/A	$ 30,300,000	2030
Redesignation of Existing Water Rights	N/A	N/A	2010
New San Jacinto River water rights	0	$ 0	2010
New Harris County bayous water rights	0	$ 9,013,000	2010
***Indirect reuse recommended at 20% of potential yield			

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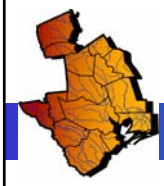

Region H
Water Planning Group

Estimated Water Supply Facility Capital Costs

Total Region H - 2010 through 2060

WWPs	$ 1,016,000,000
WUGs	$ 2,102,000,000
RWAs	$ 2,418,000,000
Total	$ 5,536,000,000

WWP costs include reservoirs and major conveyance facilities
WUG costs include treatment, storage and distribution facilities
RWA includes NHCRWA, WHCRWA and COH transmission facilities (thru 2030)

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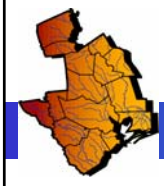

Region H
Water Planning Group

Galveston Bay & Natural Resources

- Plan tries to minimize impacts of water management strategies
- Off-channel reservoirs and system operations replace two on-channel reservoirs
- Lakes Conroe and Livingston will see decreased levels during droughts due to increased use
- Full use of water rights will reduce instream flows, although increased return flows offer some mitigation, particularly in the Trinity River basin

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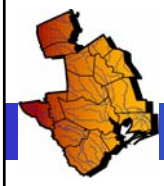

Region H
Water Planning Group

Galveston Bay & Natural Resources

Model Results: Impacts of the 2001 State Water Plan on Galveston Bay Inflows

Inflow Target	Max H	Min Q	Min Q-Sal
Historical Frequency	66%	78%	82%
GBFIG Target Frequency	50%	60%	75%
Naturalized	68%	67%	83%
Current Conditions	64%	59%	79%
Full Diversions with Return Flows	65%	59%	81%
Full Diversions with no Return Flows	43%	42%	55%
Full Diversions with RF and Region C & H Strategies (2001 Plans)	71%	67%	87%

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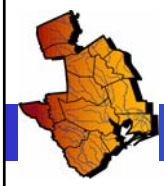

Region H
Water Planning Group

Recommended Unique Reservoir Sites

- 2 Sites Recommended as Water Management Strategies
  - Allens Creek Reservoir
  - Little River Off-Channel Reservoir
- 2 Sites Recommended as Uniquely Suited for Future Reservoirs
  - Bedias Reservoir
  - Little River Reservoir

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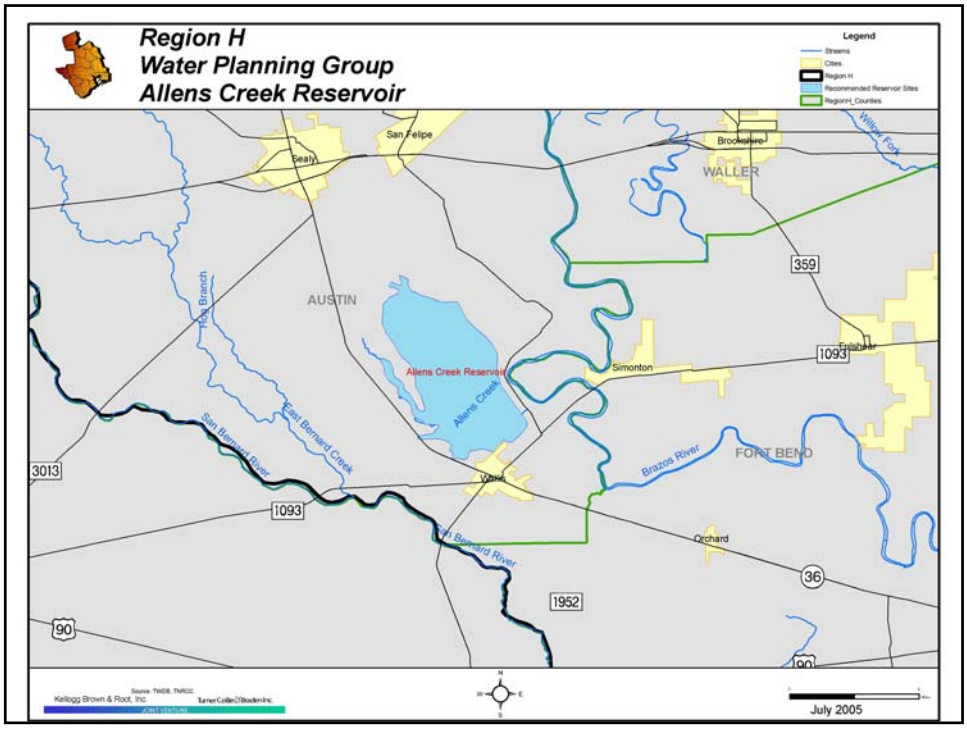
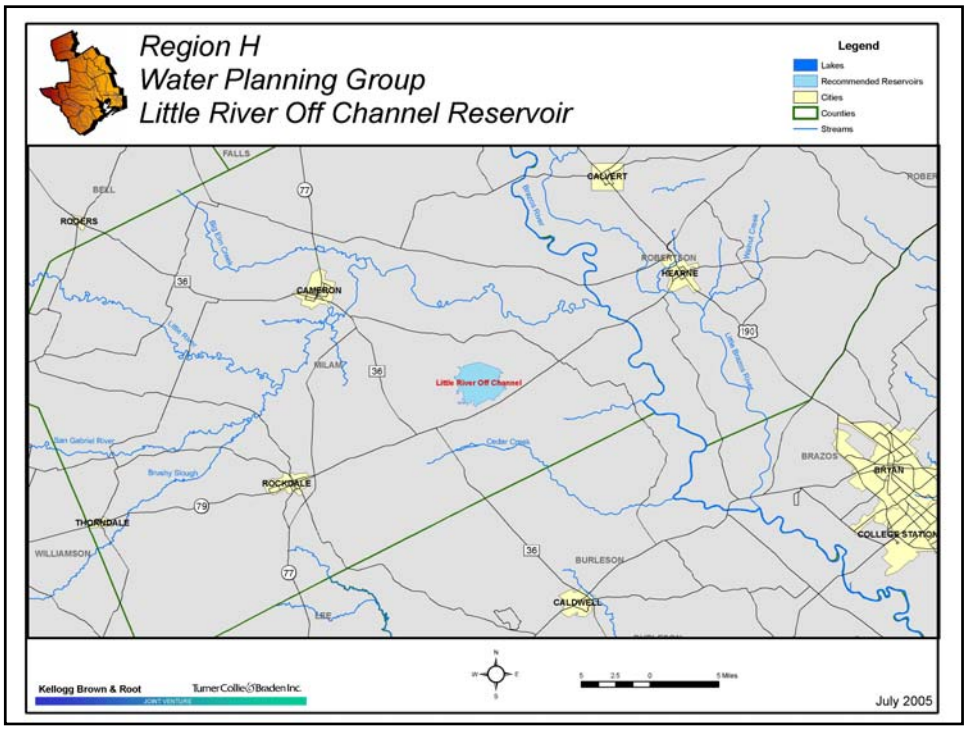
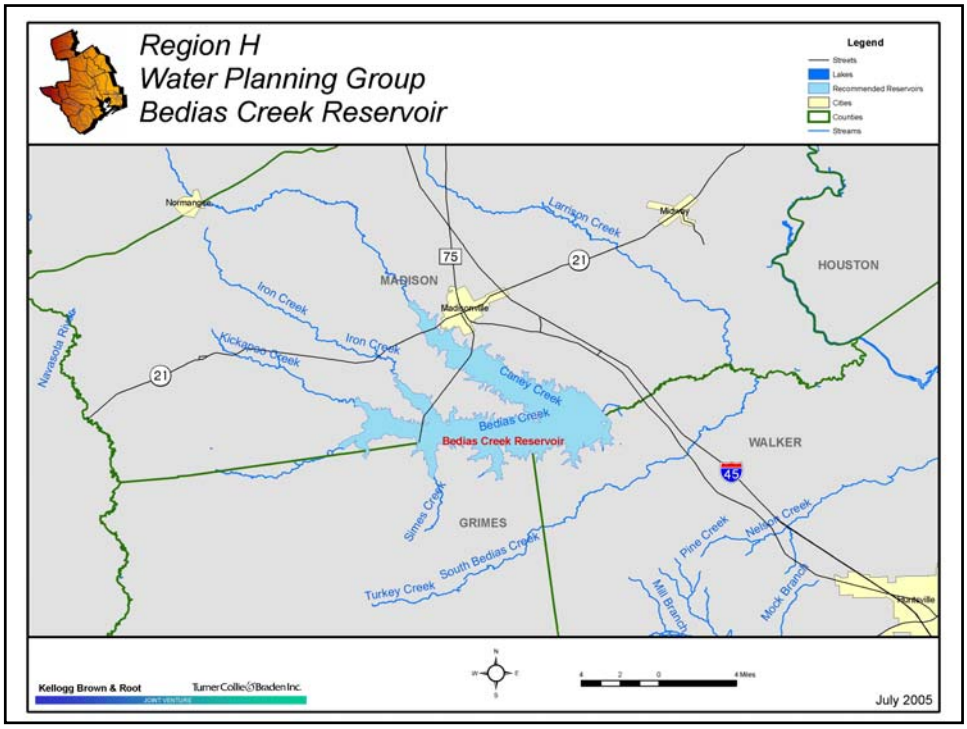

Region H
Water Planning Group
Allens Creek Reservoir
Legend
Streams
Cities
Region H
Recommended Reservoir Sites
RegionH_Counties
San Felipe
Sealy
Brookshire
WALLER
Willow Fork
Hog Branch
AUSTIN
359
Allens Creek Reservoir
Allens Creek
Simonton
1093
Fulshear
San Bernard River
East Bernard Creek
Brazos River
FORT BEND
3013
1093
West
Orchard
East Bernard River
36
1952
90
Kellogg Brown & Root, Inc.
Turner Collie & Braden Inc.
JOINT VENTURE
July 2005


Region H
Water Planning Group
Little River Off Channel Reservoir
Legend
Lakes
Recommended Reservoirs
Cities
Counties
Streams
FALLS
BELL
RODERS
77
CALVERT
Brushy Creek
Big Elm Creek
ROBERTSON
HEARNE
Wheelock Creek
36
CAMERON
193
MILAM
Little River Off Channel
Little Brazos River
San Gabriel River
Cedar Creek
BRAZOS
BRYAN
Brushy Slough
ROCKDALE
79
THORNDALE
COLLEGE STATION
WILLIAMSON
36
BURLESON
77
CALDWELL
LEE
Kellogg Brown & Root
Turner Collie & Braden Inc.
JOINT VENTURE
July 2005


Region H
Water Planning Group
Bedias Creek Reservoir
Legend
Streets
Lakes
Recommended Reservoirs
Cities
Counties
Streams
Normangee
Larrapin Creek
Midway
MADISON
75
21
HOUSTON
Iron Creek
Madisonville
Kickapoo Creek
Iron Creek
Navasota River
Caney Creek
Bedias Creek
Bedias Creek Reservoir
WALKER
45
Simes Creek
GRIMES
Pine Creek
Nelson Creek
Turkey Creek
South Bedias Creek
Mill Branch
Mock Branch
Huntsville
Kellogg Brown & Root
Turner Collie & Braden Inc.
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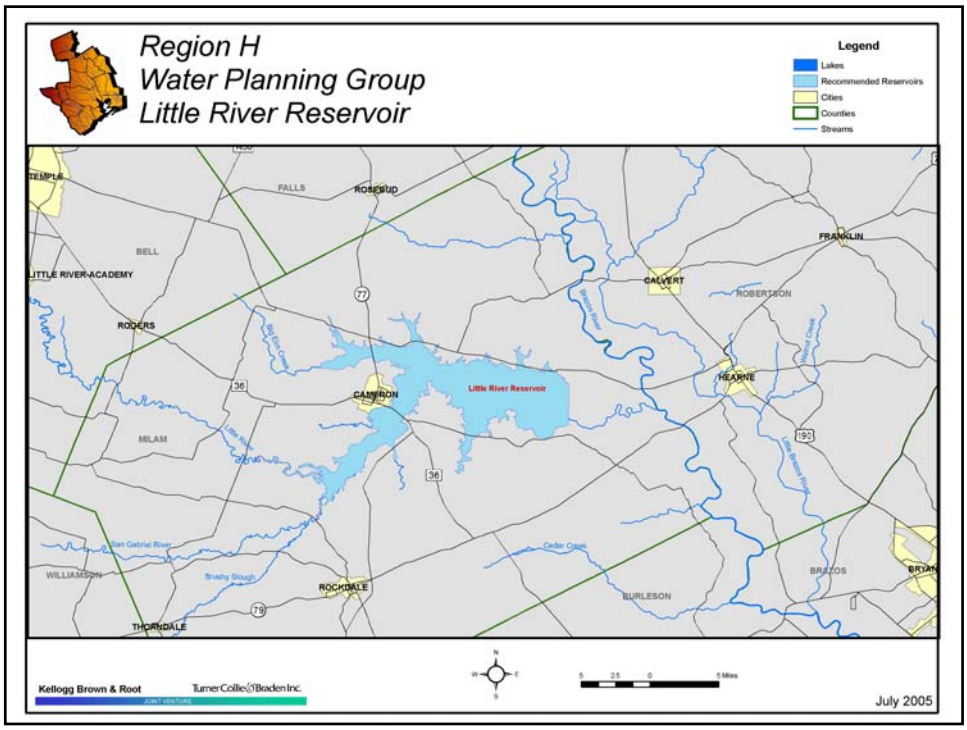
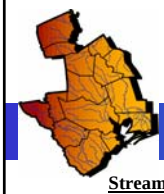

Region H
Water Planning Group
Little River Reservoir
Legend
Lakes
Recommended Reservoirs
Cities
Counties
Streams
TEMPLE
FALLS
ROSEBUD
BELL
FRANKLIN
LITTLE RIVER-ACADEMY
GALVERT
ROBERTSON
77
ROGERS
Little River Reservoir
HEARNE
CAMERON
36
MILAM
195
WILLIAMSON
ROCKDALE
BRAZOS
BRYAN
BURLESON
79
THORNDALE
Kellogg Brown & Root
Turner Collie & Braden Inc.
JOINT VENTURE
July 2005



Region H
Water Planning Group

Recommended Unique Stream Segments

Stream Segments	Counties	Features (partial list)
Armand Bayou	Harris	Armand Bayou Coastal Preserve, Great Texas Coastal Birding Trail
Austin Bayou (portion)	Brazoria	Brazoria National Wildlife Refuge, Great Texas Coastal Birding Trail, habitat for 3 bird species
Bastrop Bayou (portion)	Brazoria	Brazoria National Wildlife Refuge, Great Texas Coastal Birding Trail, habitat for 3 bird species
Big Creek (portion)	Fort Bend	Brazos Bend State Park, Great Texas Coastal Birding Trail, TPWD Ecoregion Reference Stream
Big Creek (portion)	San Jacinto	Sam Houston National Forest, Big Creek Scenic Area, Great Texas Coastal Birding Trail, Red-Cockaded Woodpecker habitat
Cedar Lake Creek (portion)	Brazoria	San Bernard National Wildlife Refuge, Great Texas Coastal Birding Trail, habitat for 4 bird species
Menard Creek	Liberty, Hardin*, Polk	Corridor Unit of Big Thicket National Preserve, diversity of rare freshwater mussels
Oyster Bayou	Chambers	Anahuac National Wildlife Refuge

*Hardin County portion is in Region I.

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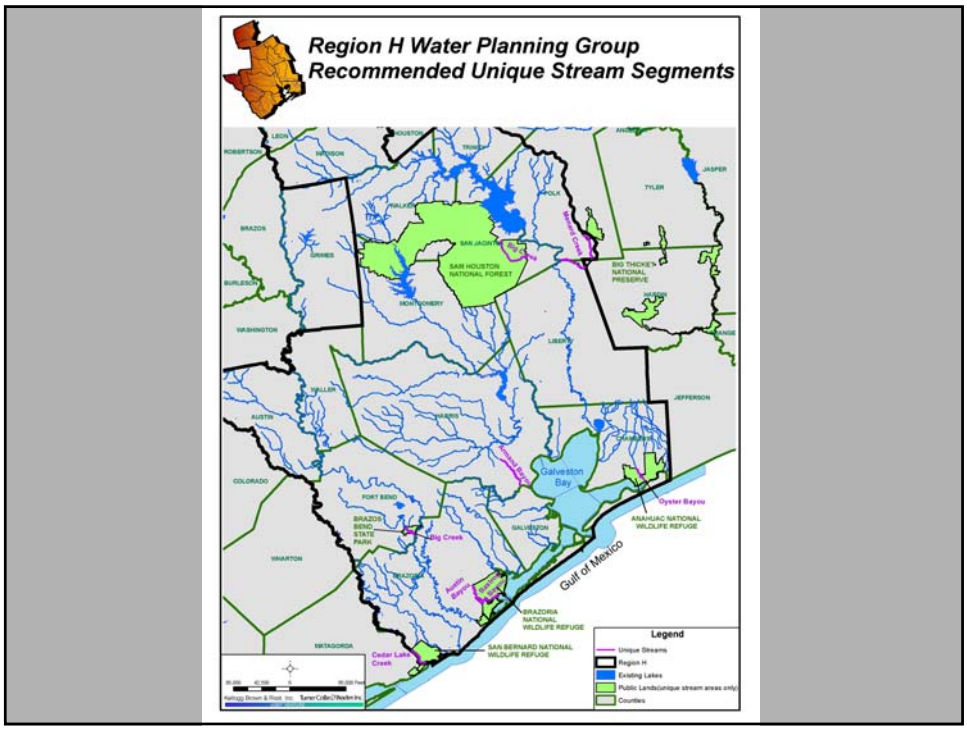

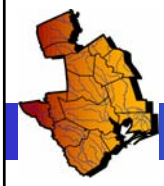

Region H
Water Planning Group

Administrative and Regulatory Recommendations

- Clarify the agency rules to address consistency with the regional water plans.
- Allow more flexibility in the allocation of alternate or multiple water management strategies to meet defined water shortages.
- Modify the notification procedures for amendments to regional water plans to limit notification requirements.
- Clarify agency rules on quantitative environmental analysis.

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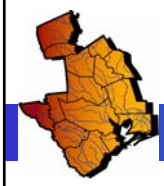

Region H
Water Planning Group

Legislative Recommendations

- Remove barriers to interbasin transfers of water within Region H.
- Adopt the recommended stakeholder process for determining bay and basin environmental flow requirements, and include Region H and the Galveston Bay Freshwater Inflows Group (GBFIG) in the Galveston Bay stakeholder group.
- Increase funding for the Bays and Estuaries programs of state resource agencies and for additional monitoring and research to scientifically determine freshwater inflow needs.
- Maintain the current rule of capture basis of groundwater law within Texas in all areas not subject to defined groundwater conservation districts.

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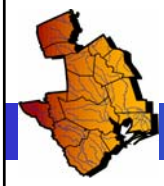

Region H
Water Planning Group

Legislative Recommendations

- Support development of Groundwater Conservation Districts to protect current groundwater users, and encourage these districts to study and manage aquifer storage and recovery.
- Establish financing mechanisms for development of new water supply projects identified within the adopted regional water plans.
- Act on the RHWPG recommendations of unique stream segments and unique reservoir sites.
- Continue funding of the State of Texas Groundwater Availability Modeling effort.
- Establish funding for agricultural research into the area of efficient irrigation practices.

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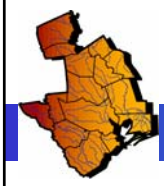

Region H
Water Planning Group

Legislative Recommendations

- Implement the programs recommended by the Water Conservation Implementation Task Force.
- Establish funding for research in advanced conservation technologies.
- Resolve the issues related to water rights permitting for indirect reuse, and advocate water reuse statewide.
- Establish flood damage liability limits for water supply reservoirs.
- Continue funding of the Regional Water Planning process.

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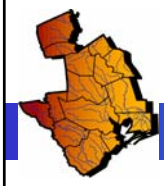

Region H
Water Planning Group

Recommendations Specific to Financing

- Increase the funding the State Participation Program as needed to allow development of these water supply projects.
- Increase the funding of the State Revolving Fund Programs in future decades, and expand the program to include coverage for system capacity increases to meet projected growth for communities.
- Increase funding of the State Loan Program for political subdivisions and water supply corporations to allow financing of near-term infrastructure cost projections.
- Increase funding of the Agricultural Water Conservation loan program, and consider adding a one-time grant or subsidy program to stimulate early adoption of conservation practices by individual irrigators.

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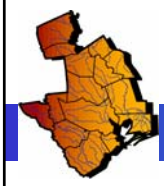

Region H
Water Planning Group

Recommendations Specific to Financing

- Continue State and Federal support of the Texas Community Development Program, and increase the allocation of funds for the Small Town Environment Program.
- Increase funding the Regional Water Supply and Wastewater Facilities Planning Program in anticipation of upcoming development throughout the state, and expand the program to include the costs for preliminary engineering design and development of detailed engineering cost estimates of recommended facilities.
- Support continued and increased funding of the USDA Rural Utilities Service at the Federal level, and fund the state Rural Water Assistance Fund.
- Provide research grants for the study of current and upcoming desalination technologies available to wholesale and retail water suppliers. Continue to fund appropriate demonstration facilities to develop a customer base, and pursue Federal funding for desalination programs.

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Region H
Water Planning Group

Recommendations Specific to Financing

- Provide increased research grants to study and better develop drought-resistant crop species and efficient irrigation practices.
- Support regulatory changes that will allow USACE to increase water supply storage in new reservoirs that they construct and manage, and investigate other alternatives for increased involvement of USACE in funding water supply projects.
- Region H supports the forming of regional facilities and encourages the State to remove any impediments to these entities, including restrictions to the use of public/private partnerships. Additionally, the State Participation Program should be made available to these public/private partnerships and to private nonprofit water supply corporations.

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Region H
Water Planning Group

Public Comments

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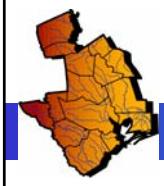

Region H
Water Planning Group

Public Comments

- Submit written comments to:
  Jim Adams, P.E.
  General Manager
  San Jacinto River Authority
  P.O. Box 329
  Conroe, TX 77305-0329
- Deadline for comments is Sept. 16, 2005

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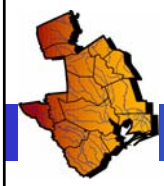

Region H
Water Planning Group

PUBLIC HEARING
for the
INITIALLY PREPARED
2006 REGION H WATER PLAN

Conducted at the
Houston-Galveston Area Council

July 14, 2005

Kellogg Brown & Root / Turner, Collie & Braden Joint Venture
LBG-Guyton
Ekistics Corporation

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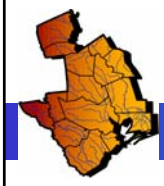

Region H
Water Planning Group

Proposed Reservoirs

- Allens Creek (Brazos River Basin)
  - 99,700 ac-ft/year
  - 2020-2030 timeframe
  - 30% BRA / 70% City of Houston
- Little River Off-Channel (Brazos River Basin)
  - 32,100 ac-ft/year
  - 2050 timeframe
  - 100% BRA
- Little River (Brazos River Basin)
  - 169,800 ac-ft/year
  - Alternate WMS
- Bedias (Trinity River Basin)
  - 90,700 ac-ft/year
  - Alternate WMS
  - 85% SJRA / 15% TRA

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SIERRA CLUB
FOUNDED 1892

Houston Regional Group
~~P. O. Box 3021~~
~~Houston, Texas 77253-3021~~
~~713-895-9309~~
http://texas.sierraclub.org/houston/

June 7, 2005

Mr. Jim Adams
Chair
Region H Water Planning Group
General Manager
San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305-0329

and

Mr. Andrew A. Sterbenz
Project Manager, Infrastructure
KBR
P. O. Box 3 (77001-0003)
4100 Clinton Drive, 03-1107G
Houston, Texas 77020-6237

Dear Jim and Andrew,

Enclosed are the comments of the Houston Regional Group of the Sierra Club (HSC) regarding the Region H Water Planning Group's (RHWPG) draft Chapter 10, Public Involvement in Developing the 2006 Region H Water Plan and associated documents of the RHWP.

Chapter 10, Public Involvement

The HSC appreciates the RHWPG's efforts on behalf of public participation and the fiscal constraints it operates under. However, the public involvement program has been insufficient to attract, involve, and retain the interest of members of the public.

For instance, as presented by a member of the public at the May 25, 2005 RHWPG meeting, there is no representative from Madison County on the RHWPG. This is crucial because an alternate water management strategy, the Bedias Dam/transfer project, will heavily impact Madison County. The citizen also stated that the daily paper in Madison County was not used to notify the public about the RHWPG meetings. To the credit of the RHWPG, at the May 25, 2005 meeting, the Madison County paper was added to the list of papers to be

notified of the RHWPG meetings. However, this appears to be a case of too little, too late. Someone should have caught this oversight a long time ago.

The HSC would like to see the RHWPG implement a truly comprehensive public outreach, education, involvement, participation, and input plan (POEPIPE). The present public participation program has not worked.

A fair, reliable, and comprehensive POEPIP is required if the RHWPG is to truly determine the desires of the residents of Region H. Elements of a fair, reliable, and comprehensive POEPIP should include:

1) A RHWPG that mirrors and represents the diverse populations and constituencies that exist in Region H.

2) Meetings held at times when the majority of the public can easily attend.

3) Meetings held in different counties and locations where these diverse populations and constituencies exist

4) Availability of materials in hard copy and on the internet several weeks before public meetings/hearings.

5) Comment deadlines that close several weeks after public meetings/hearings.

6) Publicized meetings of the RHWPG on radio, on TV, via the website, and by mailings.

7) Development and maintenance of a mailing list for those who want to receive updates and public meeting notifications.

8) A POEPIP based on conservation districts, water districts, small cities, geographic parts of large cities, and counties and other land area organizing units.

These are only some elements of a vastly expanded and funded POEPIP that are needed. The draft Chapter 10 does not include or fully commit to these elements and needs to be strengthened.

The RHWPG implements some of these elements but needs to have its public participation program upgraded so that it will do a better job. As Chapter 10 states on page 10-1, "Securing a high level of public participation continues to be a challenge for long-term planning".

There are several letters that the HSC submitted during public comment periods for the 2006 water plan that deal specifically with the RHWPG that are not in Chapter 10. These letters include:

1) May 31, 2004, this letter dealt with questions about the Region H Supplemental Funding Detail Description of Additional Study Items document.

2) September 4, 2004, this letter dealt with the May 31, 2004 letter and the proposal to amend the Region H 2001 water plan with water strategies that total 1.4 million acre-feet/year.

3) October 6, 2004, this letter dealt with the proposal to amend the Region H 2001 water plan.

We have included copies of these letters with these comments. The HSC requests that these letters be placed in Chapter 10 as public comment on the RHWPG and the 2006 water plan. If the RHWPG decides that some of these letters deal with an amendment to the 2001 Region H water plan and therefore are not are part of the 2006 water plan, we disagree. Since the amendment will change the baseline for the 2006 water plan the amendment concerns the 2006 water plan.

Socioeconomic Impacts of Unmet Water Needs in the Region H Water Planning Area

Although one consultant told the HSC that it should not submit comments on this document to the RHWPG because the Texas Water Development Board (TWDB) is responsible for its preparation, we disagree. Since the socioeconomic impacts study is part of the 2006 water plan it is legitimate to comment about it to the RHWPG. If the RHWPG is not going to review, discuss, and vote on approving this study then the public is being short-changed.

The public will not be adequately represented in the Region H area if studies by the TWDB are simply rubber stamped by the RHWPG without any review and discussion. If the RHWPG determines that it has questions or concerns about TWDB studies it is its duty to pass these questions or concerns on the TWDB. By not reviewing and considering whether there were any questions or concerns about the socioeconomic study at the RHWPG meeting on May 25, 2005, the RHWPG missed an opportunity to adequately represent its constituencies and inform the TWDB.

Page 3 of the socioeconomic study states that, "In response to requests form regional planning groups, staff of the TWDB's Office of Water Resources Planning designed and conducted analyses to evaluate socioeconomic impacts of unmet water needs." The socioeconomic study should be reviewed and discussed by the RHWPG. It is unfortunate that this did not occur at the May 25, 2005 RHWPG meeting where the entire proposed 2006 Region H water plan was passed so that it could be published and public meetings held to take comments on its adequacy.

On page 5 of the study, Table E-2, the worst-case scenario is that population losses in 2060 due to drought will be 269,610. When compared to the projected 10,897,526 population of Texas in 2060 this is 2.47% of the population of Region H and 0.6% of the entire population of Texas. Total number of children in school is not given for 2060 although the estimate is for a 66,230 reduction in number of children in school due to the drought.

Table 2 gives 2000 economic baseline figures for Region H. The HSC does not know what the projected economic figures are for 2060. Using the 2000 economic baseline figures, for total sales activity, the $26.09401 billion in losses due to drought in 2060 is 6.4% of the 2000 total sales figure; for jobs, the 187,670 in job losses due to drought in 2060 is 6.3% of the 2000 jobs figure; for regional income, the $15.39384 billion in losses due to drought in 2060 is 7.7% of the 2000 regional income figure.

The losses due to 2060 figures for these categories of economic impacts would be much smaller. Our point here is not to denigrate the losses but to point out that they are small for the region and should have a correspondingly small effect using TWDB's own figures.

The HSC is concerned that the socioeconomic study is an excuse to scare people into supporting any water management strategy that is offered. When TWDB creates a straw-man for the socioeconomic study by assuming that there will be 45 million people in Texas; plans for this growth with an equivalent infrastructure; and does little to educate Texans about the environmental, economic, social, and Quality of Life costs that such a large population will have on citizens in 2060; then we can only conclude that there does not seem to be a desire to elicit from Texans and Houstonians how they, their children, and their grandchildren want to live their daily lives in the future.

There are many public policy questions that must be answered by Texans and Houstonians before population projections are made and implemented. Some of these include:

1) What population do we want?
2) What population can we handle (so we do not exceed natural carrying capacities)?
3) Is growth in population good or bad?
4) Do we need growth in population?
5) Why do we need growth in population?
6) How much population growth should we have?
7) What quality of population growth do we want?
8) What can we do to reduce population growth?
9) Why don't we reduce population growth?
10) How much immigration is good?

11) How much immigration is bad?
12) How can we control population growth?
13) How can we implement birth control, sex education, and family planning to reduce population growth?
14) What level of economic growth do we want?
15) What level of economic growth do we need?

Without conducting a public policy debate on these and other questions first, the population projections presented are a **fait acompli** and Texans and Houstonians are not allowed a fair opportunity to voice what they desire.

By assuming and working toward the accommodation of 45 million people in Texas by 2060 the TWDB and the RHWPG ensure that any drought that occurs will have worse effects and be harder to deal with than if there were a smaller population.

The HSC urges the TWDB to conduct a survey to find out what Texans and Houstonians expect as their vision for the Quality of Life for themselves, their children, and their grandchildren. The decisions we make today will either help those who come after us or burden them with taxes, natural resource depletion, and loss of choice in the future. This is neither fair nor right.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt

Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, Texas 77096
713-664-5962

October 31, 2005

Mr. Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew St.
Houston, TX 77096

Subject: Response to Comments on Draft Chapter 10 of the 2006 Region H Regional Water Plan and other documents received at the May 25, 2005 RHWPG Meeting.

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input to draft Chapters 10 – Public Involvement and other documents distributed at the May 25, 2005 Region H Water Planning Group (RHWPG) meeting. The following letter provides responses to the comments you provided in your letter dated June 7, 2005.

Response to Comments on Chapter 10

1) The Houston Sierra Club (HSC) outlined and recommended an extensive public outreach, education, involvement, participation and input plan for the RHWPG.

The RHWPG appreciates your continued interest and enthusiasm. Implementing the "vastly expanded and funded" program you recommend is not possible within the TWDB grant budget for the 2006 plan, but the RHWPG will consider increasing the public involvement scope during the planning cycle for the 2011 Regional Water Plan. We would like to respond to two specific items here.

As to your recommendation on varying meeting times and locations to facilitate public attendance, it has been the experience of this group that changing monthly venues and times does not increase public participation. Instead, it has the affect of reducing attendance, because it inconveniences as many people as it facilitates. Also, with twenty-five voting members and representatives of three state agencies on the planning group, a consistent meeting time and place reduces member conflicts. Public meetings and hearings are scheduled at additional times and locations, but will continue to be included during the regular RHWPG meetings as well.

As to your recommendation on making materials available for public review before public meetings and hearings, the RHWPG has consistently complied with the Public Notice requirements of 31 TAC 357, Regional Water Planning Guidelines, placing copies of all documents for public review in County Libraries and County Clerk Offices. Please do not confuse the public comment period during regular RHWPG *open meetings* with *public hearings*. During the regular meetings, draft report chapters and technical memoranda were distributed, presented and discussed. The planning group was not asked to comment on and approve these draft chapters until subsequent meetings, allowing at least a month for public review and comment on the materials distributed during the regular meetings. These planning group approvals were, in effect, preliminary approvals and were still subject to comments and revisions as a part of the approval of the IPP.

2) The HSC inquired why their comment letters dated May 31, 2004, September 4, 2004 and October 6, 2004 were not included in Chapter 10.

These letters commented on Amendment 1 to the 2001 Region H Water Plan, and were included in the Amendment 1 Report. The RHWPG will consider adding copies of those letters to Appendix 10A of the 2006 Plan as well.

Response to Comments on TWDB Report: Socioeconomic Impacts of Unmet Water needs in the Region H Water Planning Area

1) The HSC disagrees with the consultant statement that comments should not be submitted because the report was generated by the TWDB.

The consultant team statement was that comments on the Report should be directed to the TWDB because they prepared the report, not that comments should not be submitted. The TWDB will also review all comment letters included in Chapter 10 of the draft report.

2) The HSC points out that the socioeconomic study should be reviewed and discussed by the RHWPG, and public comments should be received on it.

The RHWPG agrees. The study was published with the Initially Prepared (Draft) 2006 Region H Water Plan so that the public will have the opportunity to comment on it.

3) The HSC points out that the socioeconomic impacts of severe drought in the study seem to be small relative to the total size of the regional economy (2.5% reduction in population, 6.4% reduction in sales). Focusing on the estimated dollar value of the impacts ($26.1 billion in lost sales and $15.4 billion in lost income) makes the need for new water supplies seem more urgent than it is.

The RHWPG agrees that the results of the study are not easily used. However, you appear to be misinterpreting the results. The study is based on some broad assumptions in the economic model. First, the model assumes that projected growth will occur and water demands will be met from existing normal-year supplies. Shortages occur in this model as the result of reduced water availability during droughts, and economic impacts occur after drought contingency actions are implemented. In reality, portions of this region are projected to outgrow their current water supplies. Municipal surface water rights are generally permitted at their firm (drought condition) yield, so there is no normal-year surplus to support this growth. Also, groundwater availability declines over time in this region due to limitations for subsidence control. Surface water systems are being planned and constructed to convert these areas to existing supplies. Because these conditions differ from the model assumptions, the model results cannot be used as a predictive tool. Instead, they are better used as a comparative tool between impacts to various segments of the economy.

Response to Other Comments

The HSC recommends that a public policy discussion be conducted to determine what future population Texans want to have, and that the Regions plan to support the desired population target rather than the currently projected population.

The population projections used in the regional water plans are based on observed growth patterns, among other factors. Conducting the survey and discussion of desired population targets you recommend would provide some interesting data, but achieving growth targets in general, and enforcing limitations in

particular, requires new laws and regulations managing land use and development. If enacted, such regulations would then be reflected in updates to the population projections, and in the regional water plans. This recommendation should therefore be directed to the State Legislature, which has the authority to enact such laws and regulations, and not to the regional planning groups.

Thank you for your comments.

Sincerely,

David Parkhill, P.E.
Project Principal

Attachments: Sierra Club Letter Dated June 7, 2005

c: Region H Water Planning Group
Region H Consultant Team

Mr. Jim Adams
P.E., General Manager
SJRA
P.O. Box 329
Conroe, Texas 77305-0329

TIME CRUCIAL – VERY IMPORTANT

July 8, 2005

Mr. Jim Adams,

I am writing to voice my comments on the water planning group hearing set for July 12, 2005 and July 14, 2005 in Conroe and Houston. I am FOR the strengthening and strict enforcement of the Clean Water Act and environmental laws. I am FOR the designation of 8 ecologically unique stream segments in the draft RHWP. Although, I wish that Cypress Creek AND Spring Creek could have been included.

In the draft RHWP, I am AGAINST the building to meet a projected doubling in population (from under 5 million to over 10 million); construction of several dams (Allens Creek and Little River); alternative water strategies that include the Bedias Dam / transfer project which will impact the West Fork of the San Jacinto River, bottomland hardwood forested wetlands, and Sam Houston National Forest; and the protection of reservoir sites for future development.

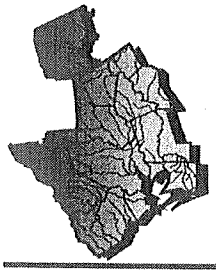
I ask that you help save and protect God's creatures and their habitats. Soon. This is crucial. Your help is greatly needed – now. (By the way, I am AGAINST clear cutting, polluters, over commercialization, deforestation, over logging, greedy developers and sprawl. I am FOR more national and state parks and forests in the United States. And, I am AGAINST oil and gas exploration and drilling, mining, logging, clear cutting, polluting, over commercialization, hunting, trapping and snaring in all national and state parks and forests. Also, I am FOR a stronger and stricter Clean Water Act, Clean Air Act, Marine Mammal Protection Act and Endangered Species Act.). I hope that you receive this letter and soon. Thank you !

Sincerely,

A native Houstonian, a member of THE SIERRA CLUB and AMERICAN RIVERS, a Texas vacationer AND camper,

Lisa Marshall

Ms. Lisa Marshall (age 35)
15023 Rain Shadow Court
HOUSTON, Texas 77070
My email: mtalk@sbcglobal.net
My home # 281-376-0155
THANK YOU !!!



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Ms. Lisa Marshall
15023 Rain Shadow Court
Houston, Texas 77070

Re: Initially Prepared 2006 Region H Water Plan

Dear Ms. Marshall:

The Region H Water Planning Group (RHWPG) appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan. Your comments will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. Thank you again for making your views known.

Sincerely,

Jim R. Adams, P.E.
Chair, Region H Water Planning Group

Andrew Sterbenz

From: brandtshnfbt@juno.com
Sent: Saturday, July 16, 2005 12:41 PM
To: carl.masterson@h-gac.com; glencall@aol.com
Subject: Region H Water Plan Comments 2005

July 14, 2005

Mr. Jim Adams
P.E., General Manager
San Jacinto River Authority (SJRA)
P.O. Box 329
Conroe Texas 77305-0329

and

Mr. J. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Adams and Mr. Ward,

Enclosed are the comments of the Houston Regional Group of the Sierra Club (HSC) regarding the draft Region H Water Plan (RHWP) as developed by the Region H Water Planning Group (RHWPG). The totally of these comments outlines what the HSC supports and or opposes in the RHWP.

If the page numbers are found to be incorrect please forgive us. The page numbers are those found in the draft documents that the HSC commented on for the past year. The HSC is also resubmitting all the comments it provided to the RHWPG previous to the public availability of the draft RHWP. We have included these comments because they still apply and we want the RHWPG to reconsider them and the Texas Water Development Board to consider them.

The HSC represents over 5,000 members in the Houston Region who are affected by the RHWP because they drink surface or ground water; canoe rivers and streams; hike in floodplains, bottomland hardwood forests, and riparian woodland forests; boat lakes; bird in wetlands; watch wildlife, swim, photograph Nature; enjoy Galveston Bay; like to look, feel, and hear the sounds of water; and participate in many other water related activities.

The RHWPG has drafted the RHWP for the Houston Region (Harris, Galveston, Brazoria, Fort Bend, Waller, Austin, Chambers, Liberty, Montgomery, San Jacinto, Polk, Trinity, Walker, Madison, and Leon Counties) to supply water for residential, municipal, commercial, industrial, agricultural, recreational, wildlife, river, and bay/estuary needs for the next 50 years.

Our comments for each chapter are briefly summarized below.

Amendment 1 of the 2001 RHWP to be incorporated in the 2006 RHWP

The HSC is extremely concerned that the RHWPG has not fully complied with the requirements of state law and regulations regarding the environmental analysis required for the 2001 and 2006 RHWPs. In particular, the quantitative reporting of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico as

required by 31 TAC 357.7(a)(8)(A)(ii), and stated in the March 14, 2005 TWDB letter, still has not been fulfilled for Amendment 1 for the 2001 RHWP and for the 2006 RHWP.

Tables 5A-1, Comparison of Potential Management Strategies by Category, and 5A-2, Required Environmental Assessments, for Amendment 1 to the 2001 Region H RHWP and to be incorporated into the 2006 RHWP, do not quantify all the environmental factors enumerated above. In The Random House Dictionary of the English Language, College Edition, 1968, quantitative is defined as, "that is or may be estimated by quantity or of or pertaining to the describing or measuring of quantity". Quantify is defined as, "to determine, indicate, or express the quantity of or to make explicit the quantity of".

To give one example in Table 5A-2, the RHWPG does not quantify what the return flows will be for Galveston Bay for each water management strategy, does not quantify how many (acres) and what kind of habitat may be impacted, and does not state which water entry point these return flows will enter Galveston Bay (Trinity River or San Jacinto River).

There is little quantitative data in Tables 5A-1 and 5A-2 which spells out the effects on environmental water needs, wildlife habitat, cultural resources, and effects of upstream development on bays, estuaries, and arms of the Gulf of Mexico.

For example, in the 2001 and 2006 RHWPs the following questions should be quantitatively answered:

How much development and what kind will occur and what impact will this have on flows into Galveston Bay?

What are the (quantitative) "minimal impacts on wetlands adjacent to streams" or "limited impacts" to wetlands?

What are the (quantitative) impacts for "limited impacts" to wildlife habitat?

How much (quantitative) does the SJRA Indirect Reuse reduce peak flows and impact low flows?

What impacts (quantitative) will new pump stations have in the COH Indirect Reuse, NHCRWA Interruptible Reuse, and BRA System Operations strategies?

How much (quantitative) will changes in diversion and return flow patterns occur and where?

How much (quantitative) will flows below Lake Houston (tidal portion) and Upper Galveston Bay be reduced?

How much (quantitative) will diversion be reduced from the Trinity Basin?

How much (quantitative) will peak flows be harvested and how much (quantitative) will the positive affect be on below median flows?

How much (quantitative) will the change in diversion and return flow patterns be, positive or negative?

How much (quantitative) will inflow be reduced to the Sabine estuary?

How many (quantitative) noxious species may be introduced and how much (quantitative) habitat may be invaded by them?

How much (quantitative) will brine outfall affect water quality?

How much (quantitative) will inflow to Trinity Bay be reduced?

How much (quantitative) will levels be reduced in Lakes Livingston and Toledo Bend?

The Amendment 1 proposal for the 2001 RHWP is to add a number of projects that essentially use up all the undedicated water rights for the upper and lower San Jacinto River, the lower Brazos River, and Lake Houston.

These projects include:

1) Porter Water Supply Corporation in Montgomery County
2,700 acre-feet/year or 879,738,300 gallons/year

2) Chambers-Liberty Counties Navigation District
80,000 acre-feet/year or 26,066,320,000 gallons/year

3) City of Houston and San Jacinto River Authority
112,000 acre-feet/year or 36,492,848,000 gallons/year

4) City of Houston
490,223 acres-feet/year or 159,728,869,900 gallons/year

5) San Jacinto River Authority
14,944 acre-feet/year or 4,869,188,576 gallons/year

6) City of Houston
160,000 acre-feet/year or 52,132,640,000 gallons/year

7) Brazos River Authority
421,449 acre-feet/year or 137,320,306,200 gallons/year

8) North Harris County Regional Water Authority
157,000 acre-feet or 51,155,153,000 gallons/year

9) Total
1,438,316 acre-feet/year or 468,645,063,976 gallons/year

The use of 468 billion gallons/year of water is of great concern to the Sierra Club due to the possible negative environmental impacts that this usage could cause. What is of greater concern is by amending the 2001 RHWP the RHWPG may bypass some or all of the environmental criteria used in the matrix to determine the suitability or priority of projects. This would cut out the use of environmental factors as criteria in determining the appropriateness of each project as well as the cumulative impact that all of these projects have together. This bypassing of environmental safeguards is catastrophic and ensures that important Quality of Life enhancements will be degraded or destroyed.

The figure of 40% was used at the September 2004 RHWPG meeting for the amount of return flow that would occur due to the use of wastewater return flows from wastewater treatment plants. This means that 60% of the water may be consumed, lost, or in some other way not returned to the San Jacinto River or its tributaries. This amount of return flow loss is significant and will affect important riparian, bottomland, national forest, spring, shallow water aquifer, and other environmentally sensitive lands.

Already in Sam Houston National Forest aquatic habitat and species have been adversely affected, cumulatively, due to human development that has occurred in the area. According to the U.S. Forest Service, in its Monitoring and Evaluation Report FY 2000-2001, Appendix F, September 19, 2002, "In 1997, Herbert found the dusky darter in six creeks on the Sam Houston NF. Only three (or 50 percent) of these same creeks contained duskys in 2000 (Healy). Despite an oil and brine spill and chronic brine leakage within the Clear Creek watershed, dusky darters appeared there in 1994, 1997 and 2000. Being silt-sensitive, recent absence of duskys from other creeks would correlate with published accounts of widespread mussel disappearance within the watershed. Probable siltation causes are motored use of unsurfaced trails and gravel surfaced roads … In 1972, Provine found the Sabine shiner was found in four different streams on the Sam Houston NF (Provine 1972). Despite surveys of o! ver 50 sites by Texas A&M cooperators and 20 sites by Forest Service personnel, this species only appeared in a Peach Creek pool in 1998 during extreme drought conditions. Siltation problems on this forest from ORVs, roads and private land activities may have impacted this species and its habitat. The construction of Lake Conroe also eliminated some former habitats … Once common throughout the forest (Hubbs 1951, 1952, Provine 1972), this species has all but disappeared from the Sam Houston NF. Two intensive studies of many sites (Herbert 1997, Healy 2000) failed to turn up any scaly sand darters. Forest personnel picked them up on the East Fork of the San Jacinto in 1993, but they were missing in 1998. Being a silt-sensitive species, it is highly likely that the same sources of siltation that have eliminated most mussel species from the forest (Howells), have greatly impacted this darter … As with the dusky darter, the same logic applies to the scaly sand darter altho! ugh it is further complicated by its

limited range and sensitivity to
perturbations. It is clear that this species has mostly disappeared form the Sam Houston NF due to the same conflicts with ORVs, roads and private land uses that have caused siltation and pollution sufficient to extirpate almost all mussels from the San Jacinto Watershed."

The Biological Evaluation conducted by Raven Environmental Services, Inc., on April 17, 2003, for the U.S. Forest Service, regarding drilling of gas wells in Sam Houston National Forest states, "Many species of fish and freshwater mussels that historically occurred in streams on the Sam Houston National Forest (SHNF) appear to have been extirpated. In 1971, an extensive survey of many of the watersheds on the SHNF was completed. Many of the fish that were collected at that time are no longer present in most watersheds. Dam building, siltation and pollution from logging practices, farms, roads, and oil and gas wells have contributed to the decline of many aquatic organisms (Horkell and Pearson 1976, Howells et al. 1996, Lemly 1982, Ritchie 1972, Winston et al. 1991) … In a recent survey for mussels, very few individuals were found in any of the streams of the SHNF. Many of the streams present on the SHNF exhibit evidence of frequent episodes of drought, low phytoplankton,!
mobile sand or loose silt substrata, low dissolved oxygen concentration, or combinations of these characteristics (Healy and Gelwick, unpublished data). Such conditions are unlikely to support viable mussel populations. Excessive sedimentation caused by poor land use practices across the landscape is one of the most common factors cited in the decline of mussel populations (Healy and Gelwick, unpublished data, Howells et al. 1996)."

Aquatic habitats have already been heavily impacted as native mussels and fish have disappeared or are very rare. This includes past impacts due to Lake Conroe that have never been mitigated. In 1972 SHNF had one of the healthiest aquatic and fish fauna in East Texas. But now this is not the case. The proposed dewatering of the Upper and Lower San Jacinto River by use of all undesignated water rights is an issue of concern for the HSC. We do not want any more cumulative, secondary, direct, or indirect impacts due to water development and use to further degrade or destroy aquatic habitats in Sam Houston National Forest, the San Jacinto Floodplain, and its tributaries. Dewatering of the floodplains will mean the intrusion of upland vegetation species and the loss of wildlife productive riparian and bottomland hardwood habitats.

The San Jacinto River Floodplain and the floodplains of tributaries that connect to this river are some of the last, best, wildlife habitats left in the Houston Area for waterfowl, for wading, shore, and songbirds, for neo-tropical migrants; for amphibians and reptiles, for fish; and for mammals. If we are to save any more wildlife habitat and compatible recreational areas these are some of the last, best, lands that are available in our rapidly growing area.

The impacts of this further use of run-of-the-river water from various tributaries of and the San Jacinto River and increased shallow water aquifer use on instream flows, seeps, shallow water aquifers, and flows to bays and estuaries would be significant. These impacts need to be assessed thoroughly and fairly in an environmental analysis that evaluates and assesses the entire San Jacinto River Watershed and all existing projects in the RHWP and any proposed projects in the 2001 and 2005 RHWPs require a cumulative impacts assessment. Not doing so at this time will preordain the impacts that these projects will cause and will further degrade and destroy aquatic habitats and species in the Upper and Lower San Jacinto River Watershed.

The proposal by the Chambers-Liberty Counties Navigation District to re-designate 80,000 acre-feet/year from irrigation to mixed use (municipal, industrial and irrigation) is of concern to the HSC. Our concern is due to the possibility that this change would encourage development along a hurricane-prone and flood-prone area in these counties. The area is better left agricultural or in native vegetation to reduce the risk to life and property.

The HSC understands that the water rights may be sold for development in already developed areas like the Houston Area. While not ideal this alternative would be better than opening the vulnerable coastal plain to development. However, we are concerned about impacts on wildlife, instream flows, flows into bays and estuaries, and wetland impacts. RHWPG should take a serious look at this project before deciding whether to approve it.

The HSC opposes the approval of Amendment 1 because it endorses the concept that water rights are to be horded. Most of the entities have no present use for the water rights

they have applied to be placed in their name in the public interest. This is the poorest justification for awarding, approving, and endorsing the grant of water rights. The public loses in this grab for unneeded water while needed instream flows and inflows into bays and estuaries for fish, wildlife, and ecosystem needs are ignored and given short shrift.

Executive Summary

On pages E-3, Population Projections, the HSC is extremely concerned that the RHWPG, TWDB, and the Texas Legislature are not asking Texans what kind of future they want for themselves, their children, their grandchildren, and all future generations. We are taking opportunities away from ourselves, children, grandchildren, and all future generations as we project population growth and development and then try to attain these projections by building to match them. We are caught in a spiral that will ever tighten on us as our resource use continues to expand and then our resources run low.

It is far better to plan for a population level and Quality of Life that Texans want versus accepting population projections that are deemed actualities instead of guesses.

On page E-5, Water Demand Projections, the HSC is concerned about a level of freshwater inflow in streams that flow into bays and estuaries that provides maximum productivity in only 50% of future years. This means at least 50% of the time Galveston Bay will not be functioning at its best and that during times of extreme drought the problem will be exacerbated even more. We do not want to sacrifice Galveston Bay, and all that it has to offer the community of life (both human and non-human), for additional population growth and development.

On page E-9, E.5.3 Socioeconomic Impact of Not Addressing Shortages, the RHWPG and TWDB make and or accept unrealistic assumptions that overestimate impacts if water is not provided at the levels projected for population estimates for 50 years in the future.

This is a scare scenario to get the public to accept what is proposed. This is not a fair or balanced calculation because the negative environmental impacts, a description of what this will mean for people's Quality of Life, and a visual narrative of what this will mean typically for people on a day-to-day basis are not given. The costs of meeting the population and development growth projections must be given which include much more than the $7.3 billion in recommended water management strategies (for example additional roads, congestion, air pollution, noise, light pollution, extended infrastructure, sprawl development, etc.).

Chapter 1, Description of Region

On page 1-15, 1.4 Region H Water Supply Sources and Providers, it is stated that "reused and recycled water and saline sources are additional supply sources utilized in Region H." There are plans to use saline aquifers in the Gulf Coast of Texas as carbon sequestration reservoirs for CO2. What impacts will carbon sequestration have on the use of saline aquifers for water supply purposes?

On page 1-15, 1.4.2 Surface Water Sources, it is stated that "There are no major springs located within Region H. The definition of "major springs" must be provided for public review, comment, and understanding. It is not just major springs that should be of concern in the Region H Water Plan. Other springs, shallow water aquifers, aquifer supplied stream flow, recharge areas, and sensitive plant and animals communities that depend on aquifer water (for example, bogs and seeps) in Sam Houston National Forest and other locations in the region must be discussed, the impacts this plan will have on these groundwater issues, and the biological and ecological mitigation that will be required to reduce the impacts.

On page 1.6.1 Existing Regional and Local Water Management Plans, third paragraph, it states that "Various management strategies would need to be implemented to accommodate growth?" Why does Region H need to accommodate growth? What is the growth target that Region H must accommodate? How can this be done and not diminish the quality of life of citizens? What will this cost? Who will pay? Who will be subsidized? What are the costs on the environment? What are citizens willing to pay or are willing to accept as decreased or degraded environment to accommodate growth? The statement "accommodate growth" by itself should not be looked upon as a mandate.

The HSC is very concerned about interbasin transfers because they ensure that our children and children's children have fewer options and that different regions of Texas will have to sacrifice their options to accommodate the options of other regions. Changes in flow, water quality, alteration of habitat, and the introduction of aquatic organisms can all be brought about by interbasin transfers. Yet the RHWP remains silent about these problems in Region H; how they will be addressed; and what the costs will be. This is another example of how the costs to citizens' environmental and Quality of Life have been ignored or given little consideration in the 2006 RHWP.

On page 1-30, Notification Procedures for Regional Plan Amendments, the HSC is not in favor of allowing Regional Plan amendments to bypass the present amendment procedure. Public review and comment opportunities are needed to ensure that the people who will pay and or suffer the consequences of any actions have the opportunity to voice their views. Already the RHWPG has recommended major amendments to the 2001 plan that will sew up all the unappropriated water in the San Jacinto River Basin. If this proposal was in affect now this major change would have been approved with little opportunity for publicity, review, and comment by the public.

On page 1-32, Interbasin Transfers, the HSC is not in favor of most additional interbasin transfers. Each Region and river basin must learn to live within its means, its carrying capacity, so that its actions do not impinge or diminish the opportunities for other regions or parts of regions to use their water resources. The HSC does not support removing barriers to make interbasin transfers easier. The HSC is concerned that junior water right holders will be shoved aside and the needs of senior water right holders will not be considered or met.

Chapter 2, Presentation of Population and Water Demands

The HSC is very concerned that the RHWPG and the TWDB are preordaining what Region H's population will be in 2060. Instead of having a public debate about what population, Quality of Life, and state of the environment, the State of Texas and the Houston area would like to have in 2060 Texans and Houstonians are being told that they must plan for a population that grows to more than double its size in Texas (from 21 million to 45 million) and in Region H (from 4,848,918 to 10,897,526).

Population projections are the very foundation of all planning, including water use, in Texas. But RHWPG and the TWDB do not know what Texans want. RHWPG and the TWDB do not ask what Texans and Houstonians want. RHWPG and the TWDB are not telling Texans and Houstonians what more than doubling the population will mean for them, their children, and grandchildren regarding costs to air quality, water quality, noise, light pollution, traffic congestion, green space and parks, farmland, social services, quality of life, infrastructure, etc.

The RHWPG and TWDB projects the population first; does not take into consideration what the environment and Quality of Life will be like before making this projection or even after this projection is made; does not determine what Texans and Houstonians want their environment and quality of life to be like before this projection is made; assumes Texans and Houstonians want more than a doubling of the population; and then plans for water use based on this more than doubling of the population.

Water demands are based on implementing a plan that has made a policy decision without public policy debate and that is not backed by Texans and Houstonians. This policy decision decides what population growth Texans and Houstonians will endure and does not determine what population growth Texans and Houstonians want.

By not conducting this public policy debate RHWPG and the TWDB ensure that construction of water projects and infrastructure for 45 million people will occur and that we will, in all probability, utilize these facilities to grow to 45 million people in 2060. By conducting water planning this way RHWPG and the TWDB implement the fallacy that "Trend is Destiny." Texans and Houstonians are not preordained to have a continuing growth in population or a growth in population that is the size that RHWPG and the TWDB says we will have.

There are many public policy questions that must be answered by Texans and Houstonians before population projections are made. Some of these include:

1) What population do we want?

2) What population can we handle (so we do not exceed natural carrying capacities)?
3) Is growth in population good or bad?
4) Do we need growth in population?
5) Why do we need growth in population?
6) How much population growth should we have?
7) What quality of population growth do we want?
8) What can we do to reduce population growth?
9) Why don't we reduce population growth?
10) How much immigration is good?
11) How much immigration is bad?
12) How can we control and direct population growth?
13) What methods can we use to control and direct population growth?
14) How can we implement birth control, sex education, and family planning?
15) What level of economic growth do we want?
16) What level of economic growth do we need?

Without conducting a public policy debate on these and other questions first, the population projections presented are a fait acompli and Texans and Houstonians are not being allowed a fair opportunity to voice what they want.

These population projections also do not take into account how growth trends can alter what the projections say. For instance the trend (and policy issue) of moving into rural areas is not reflected in the population projections in several counties that are outer-lying to Harris County (Trinity County being an example). The trend (and policy issue) of companies moving out of the more urban or populated areas and taking jobs with them to more rural areas is also not addressed in the population projections. Do we want to encourage these trends or not? Why are we not debating these public policy issues before projecting population? Texans and Houstonians are locked out of the process that determines growth, population growth, and growth in water use.

It seems obvious that the long planning time frame for water projects will cause projects to be built on speculation. This speculation in population growth and water use will then become fact. The fact that there are existing inter-basin water transfers between the San Jacinto, Brazos, Trinity, and Neches Rivers does not mean that this strategy should continue. It is the HSC contention that when a population seeks water outside of the watershed it lives in then it has already exceeded the carrying capacity of that watershed and that population is already greater than it should be.

The HSC objects to RHWPG seeking legislative approval to eliminate junior water rights. Why should profligate water users and population attractors take the water rights from others because they have not taken the responsibility to reduce their water use or population to fit the water they have that can be used? The HSC believes seeking the elimination of junior water rights in Region H is the start of the unraveling of this issue throughout Texas. The powerful haves will ensure that those who are not as powerful will suffer and must be burdened with the responsibility that the haves do not wish to carry. This is not fair or right.

The human population carrying capacity of each river basin needs to be determined, taking into account protecting sensitive areas and ecosystem needs, and then we need to plan so we do not exceed this population projection. This should be the goal of every water plan. We need a steady-state economy.

We need a full, public, debate to ensure that we get it right. By getting it wrong we ensure that we will degrade the environment that we rely on for all of our needs which means we will degrade our Quality of Life and reduce the carrying capacity for humans and especially for those who live after us. We reduce their options as we mandate water use now. We bring ourselves closer to ecological overshoot or collapse by not recognizing that humans are animals too and we are dependent on the same ecological principles as every other living organism. We cannot avoid the bullet.

The question needs to be asked: Do Texans and Houstonians want 45 million and almost 11 million people, respectively? The Houston area is already above its human carrying capacity. This is reflected individually and cumulatively by the following:

1) For air quality, the Houston area exceeds the ozone National Ambient Air Quality Standard and has high levels of toxic air pollutants
2) For water quality, many bayous and other streams exceed their water quality standards

3) For water absorption capacity, major floods occur every year in human occupied areas
4) For transportation, congestion is found on most major roads
5) For groundwater capacity, there are falling groundwater levels in many places, activated faults, and subsidence
6) For surface water capacity, overuse of surface water has led to importation of surface water across river basins
7) For protected park and ecological lands, Houston is far below standards for park acreage/1,000 people
8) For farmland, farmland use and acreage is decreasing in many counties
9) For quiet, noise is so high that noise barriers are being erected on many highways
10) For wildlife habitat, wetlands acreage is decreasing

When will the RHWPG and the TWDB address the problem of exceeding Houston's human carrying capacity?

On page 2-14, Sub-County Population, Criteria, d), the RHWPG found "growth limitations or build-out conditions in a city or utility that would result in maximum population that is less than was originally projected". Discussion about these areas and why they operate differently than other areas is needed so we have insight into whether we want to emulate this condition more with respect to water use.

In all of Chapter 2, for population projections, water demands, and associated figures, the HSC recommends that the RHWPG explain specifically why changes occur when these changes entail increases or decreases of 10% or more from previous calculations, assumptions, estimates, and projections. The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes. Throughout Chapter 2 many changes have occurred which exceed 10% but little is said of how and why this occurred.

On page 2-57, Table 2-4, another concern about percent change is found with Harris County municipal demand figures. While all percent changes are below 10%, the demand numbers are so large that any error in percent change would be significant to as low as 5%. Therefore the RHWPG should carefully examine the Harris County percent change figures to ensure their accuracy and provide this information so that the public can review, comment, and understand the basis for these changes.

With regard to the TWDB's Guidelines and Data Requirements for Addressing Revisions of the Consensus-Based Population and Water Demand Projections, the HSC questions whether residential and commercial water use should be combined together into municipal water use. The ways to approach reducing both of these water uses are different and cannot be considered best together and the growth trends can also be different. For instance, many individuals will reduce water use based on what this means for their family in the future or economics. Commercial water users will reduce water use based mostly on economics. Altruism plays a smaller role in what motivates these people when a water use education program is created.

In the TWDB guidelines another criteria that should be used is that the construction of larger water systems attracts more population growth and water use than smaller systems. That is because the bigger systems have more excess water capacity and water which can accommodate more growth. Such systems should not be given points because they can serve more people. The focus should be on systems that provide little excess capacity which fuels more excess growth. Otherwise you feed the growth machine and defeat your ability to get ahead of population growth and provide capacity for severe droughts.

The HSC is concerned that the "recommended most likely scenario" will be used as the "primary basis for planning". This ensures that a policy debate does not occur and the real policy is based on the population projections that have not been truth-tested by public debate on what population growth Texans want.

For instance, the Forecasting Methodology and Key Planning Assumptions, are based on fertility rates, survival rates, and migrations which all can be altered. Texans and Houstonians need to decide what we want within each of these three categories and then plan how we will achieve these goals. The so-called key assumptions are based on a policy decision to do nothing and accept whatever growth occurs that is induced by other policies of the State of Texas. What is the point of planning if this is all we are going to do?

The HSC does not agree with the assumption that "power generation demands will grow in

direct proportion to population growth." This one assumption ignores the importance of energy conservation and reductions in waste and increases in energy efficiencies. In the past power generation has not grown in direct proportion to population growth when energy conservation strategies have been implemented.

The HSC is particularly concerned about the impacts that these population projections and associated water use will have on Sam Houston National Forest, national wildlife refuges, states parks, and other sensitive ecological and wildlife areas. The HSC is concerned that shallow-water aquifers will dry up and that unique, seep, spring, moisture-loving, and stream-based plant and animal communities will suffer or be destroyed. The HSC is concerned that groundwater recharge areas will be paved over or contamination will be introduced through these areas.

There is no recognition in these population projections about what they will mean, in terms of impacts, to Sam Houston National Forest and other private and public protected or ecologically sensitive areas. Without giving Texans and Houstonians this information how can they agree or disagree with any population projections.

The HSC requests that the population projections be withdrawn and that the public policy issues of population growth and economic growth, including the loss of natural landscapes and the altering of sensitive ecological areas be debated and decided first before making population projections and then building water projects to meet these projections. The HSC does not accept population projections that will irretrievably and irreversibly alter the natural resources that we depend on for survival. Population projections that are beneficial to Texans and Houstonians must be developed and strategies implemented to attain them.

As one alternative to the present water use, population, and economic growth system, the HSC includes the article, "The steady state economy - What it is, entails, and connotes" as written by Mr. Brian Czech and Mr. Herman E. Daly. This document notes how the present system of economic growth affects wildlife and wildlife habitat and how a different system could be implemented that would protect natural resources while supplying human needs. The HSC urges the RHWPG and TWDB to thoroughly review, understand, debate, and act on this problem.

Chapter 3, Analysis of Current Water Supplies

On page 3-6, 3.2.3 Aquifer Conditions, there should be a discussion about the recharge area and its condition regarding potential contamination and loss of recharge potential due to land surface hardening. This is particularly important since we are predicting, projecting, and estimating into the future 50 years (until 2060). The public must know in what condition its aquifer and recharge areas will be so it has some idea about what condition its groundwater supply quality and quantity will be.

On page 3-24, 3.3.1 Available Surface Water, Chapter 3 should provide an estimate of the percent of reservoir capacity that currently and in 2060 exists so the public knows how much storage space there is in each of its surface water reservoirs. Which reservoirs will need to have their sediment supply reduced by 2060 and what strategies can be used to do this?

On page 3-35, 3.3.5 Legal and Regulatory Constraints, the HSC is concerned about the statement "It is anticipated that new interbasin transfers will be needed to support growth throughout Region H, particularly to the San Jacinto and San Jacinto-Brazos Basins where the largest population growth is occurring." If Region H is in favor of supporting growth then it appears to have a policy or de facto policy that growth is good under the conditions that will develop in Region H. Is this a logical assumption to make when Region H is already beyond its human carrying capacity?

The RHWPG does not appear to want to address population and development growth; its impacts on the environment; and whether it is best to support more growth in a condition of human carry capacity exceedance unless it relates to assisting and supporting this growth with additional water supplies. These are policies that the RHWPG should clearly explain so that the public is aware of what constraints and assumptions are in the RHWP.

In Appendix 3D, Previously Studied Potential Reservoir Sites, the HSC is not in favor of the Bedias, Humble, Cleveland, Lower Lake Creek, Tennessee Colony, Harmons, Spring Creek Lake, and Upper Lake Creek water projects due to the unacceptable environmental impacts

they will have on wildlife, ecosystems, and the natural landscape.

Chapter 4, Evaluation and Selection of Water Management Strategies Based on Needs

On page 4-1, 4., this document states "In addition to the above, this report contains a description of socioeconomic impacts of not meeting the identified needs." This document should also discuss the socioeconomic impacts of meeting the needs. This analysis should include how Quality of Life and the environment will be affected. For instance, what are the impacts that the increased population and development growth will have on air quality, water quality, toxic chemical use and disposal, noise, wildlife habitat, ecosystem functioning, traffic, etc.

On page 4-4, 4.2, this document states "Two additional strategies were considered, an interbasin transfer of existing supplies from east Texas (i.e., the Lower Neches Valley Authority and the Sabine River Authority)". The HSC is opposed to the interbasin transfer of water from the Neches/Sabine Rivers. The environmental impacts due to the construction of the project and the cumulative environment impacts that will be caused by the increased population and development growth caused by the availability of too much water will cause too much damage to the human environment.

On pages 4-4 and 4-5, 4.2.1, the HSC does not support the Bedias Reservoir, Bedias Reservoir to Lake Conroe Transfer, Little River Reservoir, and the Sabine Basin to Region H Interbasin Transfer projects. The HSC is concerned about the impacts that the Bedias Reservoir and transfer projects will have on Sam Houston National Forest and West Fork of the San Jacinto River bottomland hardwood forested wetlands.

On page 4-5, 4.2.1, the document states "Assessment of each of the potential management strategies conducted as part of this study included an evaluation of cost, environmental impacts". The assessment of environmental impacts was not detailed and therefore did not fully reveal the full depth and extent of these impacts. See comments above under Amendment 1 of the 2001 RHWP to be incorporated in the 2006 RHWP.

On page 4-7, 4.2.4, the HSC disagrees that drought management should not be a water management strategy. We believe that implementing a drought management plan early, during periods of infrequent rainfall, will help conserve water and protect and educate the public about water use. The HSC does not agree with the statement "Only the development of reliable supplies to meet projected growth will protect the region from the economic impacts of a prolonged drought." This is a recipe which will drag down opportunities to reduce environmental damage and pressure on our natural resources and Quality of Life because reduction of population and development growth will not occur.

On page 4-13, 4.3.3, Table 4-5, the HSC opposes the Bedias Reservoir and Transfer and the Little River Reservoir. We also do not agree with the designation of Alternative Water Management Strategies since alternatives are used as a way to allow environmentally damaging projects, which along with the change in the amendment process that RHWP is supporting, can be implemented with little or no public notice and input.

On page 4-14, 4.3.4, the HSC opposes the creation of Future Water Management Strategies. It appears the reason that these water management strategies are mentioned (including East Texas water transfer, Bedias Reservoir, and Little River Reservoir) is to give them future credibility as reasonable water management strategies so that they can be implemented more easily. These strategies are not reasonable and will result in environmental and Quality of Life damage that is too great.

On pages 4-18 and 4-19, 4.5.2 and 4.5.3, too little assessment of sedimentation has been conducted. As urbanization increases erosion, sedimentation of watersheds, and non-point source water pollution will increase. The current level of sedimentation for each lake; what sedimentation is projected in the future for each lake; what level of lake capacity has been reduced now; and what is projected to be the reduction in each lake's capacity due to sediment in the future is not stated. Therefore the public does not have data to review and comment on in this document about existing and projected future erosion and sedimentation of each lake.

On page 4-24, 4.5.5.2, the HSC is concerned about the redirection in water inflow into Galveston Bay. Presently, most of the inflow goes into Trinity Bay. This proposal redirects a significant amount of the inflow into the San Jacinto River. Trinity Bay is ecologically a more healthy estuary and needs more inflow than the area where the San

Jacinto River flows into Galveston Bay.

Chapter 5

On page 5-2, 5.1 Scope of Work, it is not the HSC's view, and it certainly does not fit the definition in the dictionary of "consensus" (The Random House Dictionary of the English Language, College Edition, "harmony") that this planning effort is "consensus-based".

It appears to the HSC that environmental organizations are not in "general agreement" with the water management strategies and their alternatives that have been approved to date by the RHWPG.

It appears that there has been a lack of environmental analysis that has been conducted on the water management strategies and their alternatives.

It appears that the mechanism for public input does not allow sufficient time for review and comment on documents handed out at the RHWPG public meeting before the decisions are made on those documents. At the March 1, 2005 public meeting approximately 235 pages of material was handed out which the public had to read, digest, and comment on within 5 minutes after the meeting began. This is not possible or fair.

On page 5-3, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, Chapter 5 states "This 2006 Region H Plan recommends a saltwater barrier be added above the Brazos estuary to protect water quality in that reach of the Brazos River as well". The water quality that will be protected will be "freshwater" from additional salt levels. There is no discussion about whether the saltwater migration up the river has been assisted or exacerbated by human activities and if so how much has been caused by human activities (for example freshwater inflow reductions and river channel widening and deepening). What will be done in the future to ensure that human activities do not exacerbate this problem in the future? Since the Brazos River estuary is within the river itself the impacts on the reduction of this estuary by reducing the linear length of saltwater is an important question for the RHWPG to consider.

On page 5-6, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, regarding the new contracts from existing supplies, including the Houston to GCWA transfer contractual transfers and the TRA, there should be discuss about how much return flows via wastewater treatment facility will provide "some mitigation" for "in-stream dilution".

On page 5-8, 5.3 Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs, Chapter 5 states "The future sedimentation condition benefits downstream projects, because upper basin projects have less capacity to store available flows". Will this condition remain the same throughout the entire 2060 period? How will Lakes Houston and Livingston be affected by sedimentation storage and capacity reduction? This issue should be discussed.

On page 5-9, Table 5-2: Lake Level Percentile Tables, the information is not meaningful to the public because it is not in a form that can be adequately understood. For instance, in addition to the information provided it would provide a better and more visually understandable picture if the percent acreage when full and at various degrees of emptiness is given (maximum, 90th, 75th, median, 25th, 10th, and minimum) or how many acre-feet exist at these various levels of emptiness so that the public can compare the differences in more understandable measures.

The HSC does not support the addition of alternative strategies to the RHWP. As stated by a TWDB representative, at present, there is no call for these in the plan and that legislative action may be required to allow them to be a formal part of the plan.

In particular the HSC is opposed to the future water strategy, East Texas transfer, since it will be very expensive and have a tremendous impact on the environment of Regions I and H as well as Sam Houston National Forest and Big Thicket National Preserve. We also oppose Bedias since it will have negative impacts on Sam Houston National Forest and the West Fork of the San Jacinto River bottomland hardwoods.

If everything is included in the RHWP then why call it a plan. It is highly enlightening that representatives of both the San Jacinto River Authority and the City of Houston both

said that they did not want their agencies' names linked to the East Texas water transfer strategy. It is the HSC's contention that both agencies now want and voted for this "alternative strategy".

It is also of concern to the HSC that the RHWPG appears to want to avoid public notice for important and significant amendments to the RHWP and that this is predicated on reducing costs. The real effect of implementing this will be a reduction in public participation since fewer people will be aware of the opportunity to comment at a RHWPG meeting if there is no public notice and hearing.

Chapter 6

On pages 6-1 through 6-9, the HSC realizes that for municipal uses by public water suppliers, industrial or mining, agriculture, and wholesale water providers that, as Chapter 6 states, "The goals established by wholesale water suppliers under this subparagraph are not enforceable." However, the HSC is concerned that this statement will make water conservation implementation less urgent by water users.

The HSC urges the RHWPG and the TWDB to create as many incentives and disincentives as possible to ensure that water conservation measures, Best Management Practices (BMP's), are implemented maximally. If these incentives and disincentives are not sufficient then RHWPG and TWDB should determine what measures are needed for mandatory enforcement of water conservation and push for implementation of these measures.

On page 6-10, 6.2 Drought Contingency Plan, the document says "The commission and the board by joint rule shall identify quantified target goals for drought contingency plans … Goals established under this subsection are not enforceable requirements." As we stated above for water conservation, the HSC is concerned that this statement will make meaningful drought contingency implementation less urgent.

The HSC urges the RHWPG and the TWDB to create as many incentives and disincentives as possible to ensure that drought contingency plans are implemented maximally and meaningfully. If these incentives and disincentives are not sufficient then RHWPG and TWDB should determine what measures are needed for mandatory enforcement of meaningful drought contingency plans and push for its implementation of these measures.

Chapter 7, Long-Term Protection of the State's Water Resources, Agricultural Resources and Natural Resources

On pages 7-1, 7-2, and 7-6, 7.1.2, 7.1.4, and 7.1.2 (Parks and Public Lands), the HSC is concerned about dewatering of bottomland hardwoods and ecological vegetation community impacts that will occur to the Trinity River National Wildlife Refuge. The HSC is also concerned about the impacts of reduced flows in the Trinity River and inflows in Trinity Bay that the Region H Water Plan (RHWP) recommends.

On page 7-4, 7.1.6, the HSC is concerned that "The increase in return flows from this source will mitigate, but not remedy, the reduction in base flows due to full use of water rights in the basin." This means in drought times that Galveston Bay will be given a low priority for fulfillment of its needs.

On pages 15-19, the HSC is concerned about the destruction of Luces Bayou. There must be mitigation of at least 5 to 7:1 replacement acreage for the loss of bottomland hardwood forested wetlands and other natural ecosystems. The floodplains of the San Jacinto River (West and East Forks) and Tarkington Bayou should be protected as part of the mitigation package for Luce Bayou.

On page 20, San Jacinto River Authority/City of Houston Contract, the HSC is concerned about the increase in exotic/upland species entering dewatered bottomland hardwood forested wetlands as mentioned in this document, "Reductions in instream flows will likely cause alteration/loss of aquatic habitat and may impact aquatic organisms as well as riparian habitats."

On page 23, San Jacinto River Authority/Lake Livingston Diversion, the document states "Environmental concerns related to this project include construction within the upper West Fork San Jacinto River channel and rectification of some segment of the river will likely be required." The HSC is opposed to rectification of the West Fork of the San Jacinto River.

On page 25, Trinity River Authority/City of Houston Contract Agreement, the document states "Additional transfer of Trinity River water supplies into the San Jacinto River basin will decrease freshwater inflows into the Trinity Bay estuary and may negatively impact wetland, aquatic, and riparian habitats." This document should state on this page that the Trinity River National Wildlife Refuge may be dewatered by this water management strategy.

Chapter 8, Ecologically Unique Stream Segments, Unique Reservoir Sites, Legislative Recommendations, and Water Infrastructure Financing Recommendations

On page 8-4, Table 8-1, Streams Considered for Recommendation as Unique, the HSC appreciates the consultant's work in reviewing stream recommendations. However, we believe the consultant incorrectly screened and analyzed some of the candidates that the HSC submitted.

For example, Caney Creek (Walker/Harris Counties), East Sandy Creek, Briar Creek, Henry Lake Branch, West Sandy Creek, Little Lake Creek, and the West Fork of the San Jacinto River should have been assessed as having met the high water quality/aesthetic value criterion. Several of these streams are spring-fed and or the water quality appears to be at least as good as other streams that were assessed as having high water quality/aesthetic value.

The same can be said for biological function criterion for West Sandy Creek, the West Fork of the San Jacinto River, Little Lake Creek, Henry Lake Branch, and Briar Creek, since all of these streams have important biological assemblages of organisms and important wetland, aquatic, and terrestrial habitats that exist in beside, or adjacent to them.

Therefore we believe the analysis conducted was deficient and does not reflect the importance of these streams. The analysis inadvertently makes these streams appear to the public and decision-makers as less biologically and ecologically important than they actually are. The analysis needs to be redone for the streams mentioned above and the matrix score recalculated.

On pages 8-11 and 8-12, 8.3 Unique Reservoir Sites, the HSC is opposed to designating Bedias Reservoir as a unique reservoir site since its construction and transfer of water to Lake Conroe will negatively impact Sam Houston National Forest, bottomland hardwood forested wetlands, and recreational areas. Bedias Reservoir is not needed for water use for at least the next 50 years and local sponsors are not able or are unwilling to fulfill their fiscal obligations. The HSC believes that construction of this reservoir will cost much more than the $142,700,000 that is quoted.

On page 8-16, 8.4.3, Consistency with the Regional Water Plans, the HSC is concerned that this recommendation will result in a reduction of public participation notification. By the time Texas Commission on Environmental Quality (TCEQ) approves a water rights permit the momentum to designate the permit as consistent with the RHWP will be overwhelming politically and the public will be hard pressed to prevent such a proposal.

On page 8-17, 8.4.3, Notification Procedures for Regional Plan Amendments, the HSC opposes the reduction of public notification and participation opportunities for significant amendments to the RHWP. This recommendation does not define what "limited portion of the region" means and does not differentiate between what are significant and non-significant amendments. The HSC cannot support this recommendation as a blanket statement because of this failure to differentiate between significant and non-significant.

On page 8-17, 8.4.4, Interbasin Transfers, the HSC is concerned about the proposal to change junior water rights requirements. It is only fair that water rights holders take their turn and not attempt to reprioritize other water rights holders. By eliminating junior water rights requirements the State of Texas supports and encourages living beyond our water means. This action would continue the support of the wrong-headed policy of exceeding carrying capacity for a watershed. This policy takes opportunities for Quality of Life and growth from one watershed and gives them to another watershed.

This proposal ensures that environmental protection will take a backset to additional development and growth. Quality of Life will suffer and people will have a less peaceful life than they would if they lived within their means.

On pages 8-17 and 8-18, 8.44, Instream Flows and Bay and Estuary Inflows, the updating of environmental flow set-asides (every 10 years) should be synchronized with the update of the RHWP (every 5 years). This ensures that environmental flow set-sides are not forgotten and get the benefit of the most recent scientific research in the RHWP before irretrievable political and financial commitments are made.

On page 9-2, 9.3.1 Summary and pages 9-3 and 9-4, the HSC is concerned that the State Participation Program will lead to the construction of water projects that are not needed or whose need will not be required for decades. This appears to be a backdoor way to subsidize water projects that otherwise could not be justified on their own merit and which local interests are either incapable or do not want to pay their fair share of project costs.

At the Region H Water Planning Group meeting on May 4, 2005 some members stated that subsidies for desalination projects were not appropriate and that the free market should decide who and how water is provided. Apparently this concern about subsidies disappears when talking about water reservoirs and conveyance projects where local interests cannot or do not want to shoulder their own fiscal responsibilities.

The HSC is concerned that speculative water projects will be funded and developed through this program that artificially induce growth in human population and development which will further strain the State of Texas' ability to supply needs to citizens and will further exceed the human carrying capacity of watersheds and their ability to service existing populations.

In particular the HSC opposes using this fund to pay for the Bedias Reservoir and its transfer facilities. These projects will negatively impact Sam Houston National Forest, bottomland hardwood forested wetlands, and recreational areas. Sam Houston National Forest has lost several thousand acres that never were mitigated due to the construction and operation of Lake Conroe.

On page 9-3, 9.3.1 Summary and pages 9-8 and 9-9, the HSC does not support further involvement by the U.S. Corps of Engineers in water projects in the Region H area. The Corps has a poor track record of protecting the environment and financially not been honest with the U.S. Congress and the American Public about financial costs of all of its water projects.

The HSC opposes the Bedias Reservoir and its transfer facilities and their designation as Corps projects because these projects will negatively impact Sam Houston National Forest, bottomland hardwood forested wetlands, and recreational areas. Sam Houston National Forest has lost several thousand acres, that never were mitigated, due to the construction and operation of Lake Conroe.

On page 9-4, State Revolving Fund Programs, these programs should also allow the acquisition of recharge areas. This will ensure that recharge areas are protected from activities that will negatively affect their water quality and quantity capability and carrying capacity over time.

Chapter 10, Public Involvement

The HSC appreciates the RHWPG's efforts on behalf of public participation and the fiscal constraints it operates under. However, the public involvement program has been insufficient to attract, involve, and retain the interest of members of the public.

For instance, as presented by a member of the public at the May 25, 2005 RHWPG meeting, there is no representative from Madison County on the RHWPG. This is crucial because an alternate water management strategy, the Bedias Dam/transfer project, will heavily impact Madison County. The citizen also stated that the daily paper in Madison County was not used to notify the public about the RHWPG meetings. To the credit of the RHWPG, at the May 25, 2005 meeting, the Madison County paper was added to the list of papers to be notified of the RHWPG meetings. However, this appears to be a case of too little, too late. Someone should have caught this oversight a long time ago.

The HSC would like to see the RHWPG implement a truly comprehensive public outreach, education, involvement, participation, and input plan (POEPIPE). The present public participation program has not worked.

A fair, reliable, and comprehensive POEPIP is required if the RHWPG is to truly determine the desires of the residents of Region H. Elements of a fair, reliable, and comprehensive POEPIP should include:

1) A RHWPG that mirrors and represents the diverse populations and constituencies that exist in Region H.

2) Meetings held at times when the majority of the public can easily attend.

3) Meetings held in different counties and locations where these diverse populations and constituencies exist

4) Availability of materials in hard copy and on the internet several weeks before public meetings/hearings.

5) Comment deadlines that close several weeks after public meetings/hearings.

6) Publicized meetings of the RHWPG on radio, on TV, via the website, and by mailings.

7) Development and maintenance of a mailing list for those who want to receive updates and public meeting notifications.

8) A POEPIP based on conservation districts, water districts, small cities, geographic parts of large cities, and counties and other land area organizing units.

These are only some elements of a vastly expanded and funded POEPIP that are needed. The draft Chapter 10 does not include or fully commit to these elements and needs to be strengthened.

The RHWPG implements some of these elements but needs to have its public participation program upgraded so that it will do a better job. As Chapter 10 states on page 10-1, "Securing a high level of public participation continues to be a challenge for long-term planning".

Water Infrastructure Financing

The HSC finds it unacceptable that the RHWPG has not finished its survey of water user groups and therefore cannot provide information about water infrastructure financing. This RHWP should be withdrawn and meetings reset when this information is prepared and available to the public.

Socioeconomic Impacts of Unmet Water Needs in the Region H Water Planning Area

Although one consultant told the HSC that it should not submit comments on this document to the RHWPG because the TWDB is responsible for its preparation, we disagree. Since the socioeconomic impacts study is part of the 2006 water plan it is legitimate to comment about it to the RHWPG. If the RHWPG is not going to review, discuss, and vote on approving this study then the public is being short-changed.

The public will not be adequately represented in the Region H area if studies by the TWDB are simply rubber stamped by the RHWPG without any review and discussion. If the RHWPG determines that it has questions or concerns about TWDB studies it is its duty to pass these questions or concerns on the TWDB. By not reviewing and considering whether there were any questions or concerns about the socioeconomic study at the RHWPG meeting on May 25, 2005, the RHWPG missed an opportunity to adequately represent its constituencies and inform the TWDB.

Page 3 of the socioeconomic study states that, "In response to requests form regional planning groups, staff of the TWDB's Office of Water Resources Planning designed and conducted analyses to evaluate socioeconomic impacts of unmet water needs." The socioeconomic study should be reviewed and discussed by the RHWPG. It is unfortunate that this did not occur at the May 25, 2005 RHWPG meeting where the entire proposed 2006 Region H water plan was passed so that it could be published and public meetings held to take comments on its adequacy.

On page 5 of the study, Table E-2, the worst-case scenario is that population losses in 2060 due to drought will be 269,610. When compared to the projected 10,897,526 population

of Texas in 2060 this is 2.47% of the population of Region H and 0.6% of the entire population of Texas. Total number of children in school is not given for 2060 although the estimate is for a 66,230 reduction in number of children in school due to the drought.

Table 2 gives 2000 economic baseline figures for Region H. The HSC does not know what the projected economic figures are for 2060. Using the 2000 economic baseline figures, for total sales activity, the $26.09401 billion in losses due to drought in 2060 is 6.4% of the 2000 total sales figure; for jobs, the 187,670 in job losses due to drought in 2060 is 6.3% of the 2000 jobs figure; for regional income, the $15.39384 billion in losses due to drought in 2060 is 7.7% of the 2000 regional income figure.

The losses due to 2060 figures for these categories of economic impacts would be much smaller. Our point here is not to denigrate the losses but to point out that they are small for the region and should have a correspondingly small effect using TWDB's own figures.

The HSC is concerned that the socioeconomic study is an excuse to scare people into supporting any water management strategy that is offered. When TWDB creates a straw-man for the socioeconomic study by assuming that there will be 45 million people in Texas; plans for this growth with an equivalent infrastructure; and does little to educate Texans about the environmental, economic, social, and Quality of Life costs that such a large population will have on citizens in 2060; then we can only conclude that there does not seem to be a desire to elicit from Texans and Houstonians how they, their children, and their grandchildren want to live their daily lives in the future. There are many public policy questions that must be answered by Texans and Houstonians before population projections are made and implemented. See Chapter 2, Presentation of Population and Water Demands, for our comments about these issues.

Without conducting a public policy debate on these and other questions first, the population projections presented are a fait acompli and Texans and Houstonians are not allowed a fair opportunity to voice what they desire.

By assuming and working toward the accommodation of 45 million people in Texas by 2060 the TWDB and the RHWPG ensure that any drought that occurs will have worse effects and be harder to deal with than if there were a smaller population.

The HSC urges the TWDB to conduct a survey to find out what Texans and Houstonians expect as their vision for the Quality of Life for themselves, their children, and their grandchildren. The decisions we make today will either help those who come after us or burden them with taxes, natural resource depletion, and loss of choice in the future. This is neither fair nor right.

The HSC supports the following:

1) Sufficient freshwater inflows for optimal year-round habitat and protection in rivers/streams and in Galveston Bay/other bays/estuaries to ensure that fish, wildlife, riparian woodlands (streamside vegetation), bottomland hardwood forested wetlands, and other sensitive areas.

2) Strong water conservation requirements for residential, municipal, commercial, industrial, agricultural uses.

3) Reuse of water return flows with guarantees that rivers/streams and bays/estuaries are not harmed by this reuse.

4) The designation of the 8 ecologically unique stream segments (Armand Bayou - Harris Co., Austin Bayou - Brazoria Co., Bastrop Bayou - Brazoria Co., Big Creek - Fort Bend Co., Big Creek - San Jacinto Co., Cedar Lake Creek - Brazoria Co., Menard Creek - Liberty, Hardin, and Polk Cos., and Oyster Bayou - Chambers Co.) that are in the Region H water plan.

The HSC also supports adding additional ecologically unique stream segments in Sam Houston National Forest including Caney Creek, East Sandy Creek, Briar Creek, Boswell Creek, Henry Lake Branch, West Sandy Creek, Little Lake Creek, Winters Bayou, Harmon Creek, and the East and West Forks of the San Jacinto River; the Trinity River, Old River, and Lost River that flows through the Wallisville Area; East Bay Bayou and Onion Bayou that flows through Anahuac National Wildlife Refuge; the Trinity River that flows through the Trinity River

Wildlife Refuge; and the Brazos River that flows through Brazos Bend and Stephen F. Austin State Parks.

5) A survey of Texans/Houstonians to determine what they, their children, and grandchildren want by 2060 regarding Quality of Life, environmental health, population growth, and smart growth and how the doubling of population to 40 million will impact these desires. The Region H water plan should reflect these desires and not simply build water projects to meet a projected population of 40 million.

6) Requiring each significant water rights proposal going through a public amendment process which includes public notification, a 30-day public comment period, and a public hearing before deciding whether to add the water rights proposal to the RHWP.

The HSC opposes and wants removed from the RHWP:

1) The Bedias Dam/water transfer alternate water management strategy and the East Texas Water Transfer (Sabine/Neches Rivers) future water management strategy, because they will have unacceptable environmental impacts on fish, wildlife, riparian woodlands (streamside vegetation), bottomland hardwood forested wetlands, the West Fork of the San Jacinto River or the Neches and Sabine Rivers, Sam Houston National Forest or Big Thicket National Preserve, and Galveston Bay or Sabine Lake.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt Mannchen, Chair, Forestry Subcommittee
Houston Sierra Club, 5431 Carew
Houston, Texas 77096
713-664-5962

October 31, 2005

Mr. Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew St.
Houston, TX 77096

Subject: Response to Comments on the Initially Prepared 2006 Region H Regional Water Plan and on Amendment 1 to the 2001 Region H Water Plan.

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan (IPP) and the Amendment to the 2001 Region H Water Plan. The following letter provides responses to the comments you provided in your letter dated July 14, 2005.

Response to Comments on Amendment 1 to the 2001 Region H Water Plan

1) The Houston Sierra Club (HSC) expressed concern that the Amendment Report does not comply with the requirements of conducting a quantitative environmental analysis of all potential water management strategies. In support of this concern, you cite entries containing text instead of numeric values in Table 5A-1, Comparison of Potential Management Strategies by Category, and Table 5A-2, Required Environmental Assessments.

The water management strategy assessments were limited by the information available for the various strategies. For example, several of the water rights applications did not specify the size and location of the pump station(s) required to divert the requested water. Without knowing the diversion locations, the consultant team could not delineate between the reach of the river or stream above the diversion point, which would be unaffected, and the reach below the diversion point, which would experience decreased flows. Also, without knowing the location of the required pump station, the team could not determine the current land use at the site, and assess whether impacts to habitat would occur.

Given this limitation, the team had several options in completing the evaluation. The most conservative option would be to assume that the entire proposed facility would impact wetlands and habitats. The most generous option would be to assume that the entire facility could be sited to avoid all wetlands and habitats. The third option is to acknowledge that impacts may occur, depending upon the site selected, but they cannot be quantified without additional data. That was the option selected for all of the entries you cite in your comment letter.

2) The HSC expressed concern that the Water Management Strategies in Amendment 1 total 1,438,316 acre-feet per year of new water rights, and points out that using all that water would have some environmental effects.

While the water management strategies (WMS) do total to 1.4 million acre-feet per year, please note that only the 2,700 acre-feet/year of groundwater supply in Montgomery County is recommended to meet a projected demand under Amendment 1. Also, the permit amendment for Chamber-Liberty Counties

Navigation District recommends adding a use type to an existing permit, not diverting an additional 80,000 acre-feet per year from the Trinity River. The remaining permits are added as water provider strategies only. In the 2006 Region H Water Plan, the Brazos River Authority permit application is recommended to meet demands in Brazoria and Fort Bend Counties, and the Little River Reservoir is removed as a WMS. Wastewater reuse is recommended to meet demands for customers of the City of Houston, the San Jacinto River Authority and the North Harris County Regional Water Authority, and Bedias Reservoir is removed as a WMS. The wastewater reuse strategies do not recommend diverting 100% of the potential yield, but only enough to meet the projected demands.

3) The HSC expressed concern that wastewater reuse will only allow 40% of diverted flows to return to the stream. This means that 60% of the water may be consumed, lost, or in some other way not returned to the San Jacinto River or its tributaries. This amount of return flow loss is significant and will affect important riparian, bottomland, national forest, spring, shallow water aquifer, and other environmentally sensitive lands.

In this region, the typical wastewater return flow volume is 60% of the total amount diverted for use. If water is diverted again for indirect reuse, the return flow would be 60% of the amount diverted, or 36% of the original diversion. In the plan, wastewater reuse is recommended for implementation in 2050 when demands and return flows will be greater than they are today. The increase in return flows due to increased demand (about 50%) is greater than the decrease in return flows due to reuse (about 24%), leaving a net increase of about 26%.

4) The HSC expressed concern that the proposed water rights will dewater the Upper and Lower San Jacinto River.

The proposed run-of-river water rights on the Upper San Jacinto River use existing diversion points at Lake Houston. Flows through the Sam Houston National Forest and bottomland habitats should be unchanged. The wastewater reuse permits affect the Spring Creek watershed and those watersheds to the south, which are urbanized. These permits may reduce current return flows by up to one-third, as discussed above.

5) The HSC expressed concern that redesignating irrigation water rights for mixed use (adding municipal and industrial use) would encourage growth in Chambers County.

The RHWPG appreciates your concern.

6) The HSC opposes the approval of Amendment 1 because there is no present use for the water rights being requested.

Your opposition is noted. The public agencies requesting these water rights are looking at the projected future demands outlined in this plan. Your objection to the population and demand projections was noted previously.

Response to Comments on the Executive Summary of the IPP

The HSC resubmitted comments originally provided in a letter dated May 8, 2005.

Please refer to our previous response letter dated May 20, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Chapter 1 of the IPP

The HSC resubmitted comments originally provided in a letter dated December 14, 2004.

Please refer to our previous response letter dated January 26, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Chapter 2 of the IPP

The HSC resubmitted comments originally provided in a letter dated December 14, 2004.

Please refer to our previous response letter dated January 26, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Chapter 3 of the IPP

The HSC resubmitted comments originally provided in a letter dated January 26, 2005.

Please refer to our previous response letter dated February 15, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Chapter 4 of the IPP

The HSC resubmitted comments originally provided in a letter dated April 19, 2005.

Please refer to our previous response letter dated April 26, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Chapter 5 of the IPP

The HSC resubmitted comments originally provided in a letter dated March 28, 2005.

Please refer to our previous response letter dated April 19, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Chapter 6 of the IPP

The HSC resubmitted comments originally provided in a letter dated December 14, 2004.

Please refer to our previous response letter dated January 26, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Chapter 7 of the IPP

The HSC resubmitted comments originally provided in a letter dated April 19, 2005.

Please refer to our previous response letter dated April 26, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Chapter 8 of the IPP

The HSC resubmitted comments originally provided in a letter dated May 8, 2005.

Please refer to our previous response letter dated May 20, 2005. Please note that the IPP was updated to address some of the comments on the original draft.

Response to Comments on the Infrastructure Financing Survey

The HSC finds it unacceptable that the RHWPG has not finished its survey of water user groups and therefore cannot provide information about water infrastructure financing. This RHWP should be withdrawn and meetings reset when this information is prepared and available to the public.

The TWDB issued a clarification to the planning guidance, stating that the Water Infrastructure Financing Survey should be conducted concurrently with the public review period for the IPP. This makes it easier for the survey recipients, because the IPP is available for them to refer to. Also, the survey is only intended to document the anticipated methods of paying for the infrastructure identified in the plan. If the survey responses include recommendations about the plan, they will be considered and incorporated with the other public comments in the final plan.

Response to Comments on the Chapter 10 of the IPP

The HSC resubmitted comments originally provided in a letter dated June 7, 2005.

Please refer to our response letter dated August 12, 2005, mailed concurrently with this letter.

Response to Comments on the TWDB Socioeconomic Impacts Study

The HSC resubmitted comments originally provided in a letter dated June 7, 2005.

Please refer to our response letter dated August 12, 2005, mailed concurrently with this letter.

Response to General Comments on the IPP

The RHWPG acknowledges the HSC support of freshwater inflows for rivers, streams, bays and estuaries; water conservation; wastewater reuse; designation of ecologically unique streams; surveying Texans about Quality of Life; and continuing to require public comment on water rights applications. The RHWPG also acknowledges the HSC opposition to Bedias Reservoir and the East Texas Water transfer.

Thank you for your comments.

Sincerely,

David Parkhill, P.E.
Project Principal

Attachments: Sierra Club Letter Dated June 7, 2005

c: Region H Water Planning Group
Region H Consultant Team

CITY OF LAKE JACKSON

25 OAK DRIVE • LAKE JACKSON, TEXAS 77566-5289 • 979-415-2400 • FAX 979-297-9804

July 28, 2005

VIA Certified Mail
7002 2410 0000 2166 2823

Jim Adams, PE
General Manager
San Jacinto River Authority
PO Box 329
Conroe, TX 77305-0329

VIA Certified Mail
7002 2410 0000 2166 2830

J. Kevin Ward
Executive Administrator
Texas Water Development Board
PO Box 13231
Austin, TX 78711-3231

Dear Mr. Adams and Mr. Ward:

Thank you for this opportunity to comment on the "Initially Prepared 2006 Region H Water Plan".

If I am reading the plan correctly, it seems to say that the City of Lake Jackson has a current capability/allocation of producing 559 acre-feet/year of groundwater from the Gulf Coast Aquifer. The plan calls for us to expand this use of groundwater to a maximum use of 1,032 acre-feet/year of groundwater in 2030.

This is a drastic departure from the 2001 Region H Plan. In that plan we had a year 2000 allocation of 1,500 acre-feet/year of groundwater expanding to a maximum use of 2,261 acre-feet/year of groundwater in 2050.

Our actual consumption of groundwater over the last five years, as reported to the TWDB, averaged 1,609 acre-feet/year. We estimate that our existing in-place infrastructure could easily produce as much as 3,000 acre-feet/year of groundwater. It is the intent of the city to use and maintain its already developed groundwater system; it was developed at considerable expense.

Therefore, we request that the 2006 Region H Water Plan be modified to reflect that the City of Lake Jackson's existing and future groundwater supply/allocation is at least the 2,261 acre-feet/year allocated to us under the 2001 plan.

We recognize that this may require some redistribution of water resources amongst other entities but feel that as much as possible the water management strategies should allocate already developed water supplies to the entities that have developed them and are already using them. In our particular case, an offsetting amount of undeveloped surface water could be allocated to an entity that had not already developed its groundwater supply as allocated by the plan.

Furthermore, it is the intent of the City of Lake Jackson to develop a wastewater reuse system. We would ask that this be a water management strategy incorporated into the plan. It is our intention that by year 2010 wastewater reuse would be 250 acre-feet/year expanding incrementally to 500 acre-feet/year by year 2060.

If I can provide more information to you regarding this matter, please contact me.

Sincerely,

Craig Nisbett, PE
Public Works Director

C: William P. Yenne, City Manager

October 31, 2005

Mr. Craig Nisbett, P.E.
Public Work Director
City of Lake Jackson
25 Oak Drive
Lake Jackson, TX 77566-5289

Subject: Response to Comments on the Initially Prepared Region H 2006 Water Plan.

Dear Mr. Nisbett:

The Region H Regional Water Planning Group Consultant Team appreciates your comments on the 2006 Region H Initially Prepared Plan (IPP) as provided in your letter dated July 28, 2005. Per your request, the 2006 Region H IPP will be modified to reflect a groundwater supply allocation to the City of Lake Jackson of 2,261 acre-feet per year.

You also requested that the 2006 Region H IPP be modified to include wastewater reuse as a water management strategy for the City of Lake Jackson. This requested modification cannot be included in the IPP at this time as a stand-alone management strategy due to lack of sufficient detailed information related to this strategy. However, the Region H WPG generally supports wastewater reclamation as a water management strategy and the City of Lake Jackson is encouraged to submit additional information regarding this strategy during the development of subsequent regional plans for this area, including such information as the anticipated amount and timing of planned wastewater reuse, the predicted cost and institutional issues associated with the reuse, and an analysis of any expected environmental impacts.

Since the City of Lake Jackson is predicted to experience water supply shortages in the future, water conservation has been recommended as a water supply management strategy for the City in the current plan, including target conservations goals. A list of potential municipal conservation activities is included in Chapter 4, Appendix 4B-1 of the IPP. Although not specifically listed there, a wastewater reuse strategy could also be used to contribute towards meeting these conservation goals.

Thank you for your comments.

Sincerely,

David L. Parkhill, P.E.
Project Principal

c: Region H Water Planning Group
Region H Consultant Team

LEAGUE OF WOMEN VOTERS
OF THE HOUSTON AREA www.lwvHouston.org
2650 Fountain View - Suite 328 Houston, Texas 77057-7631 713-784-2923 FAX 713-784-2984 lwv@lwvHouston.org

August 8, 2005

Mr. Jim Adams, P.E.
General Manager
SRJA
PO Box 329
Conroe, Texas 77305-0329

Dear Mr. Adams:

The League of Women Voters of the Houston area appreciates the opportunity to give input to the Region H Water Planning Group regarding the Houston area. The League always supports citizen involvement in policy making processes.

The Texas League has positions on water supporting comprehensive long-range state water planning with emphasis on the following:

- development of adequate supplies by ecologically and financially sound measures
- Conservation and reuse land and fragile ecosystem protection
- Social, economic, environmental and land use implications

In keeping with this position, the League supports several aspects of the Region H Plan:

- Designation of 8 ecological unique stream segments
- Increased implementation of water conservation for cities, agriculture and industry
- More wastewater reuse
- Freshwater inflows for Galveston Bay

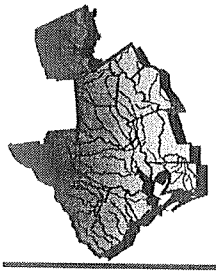
The League has concerns about other aspects of the Plan:

- Construction of several dams (Allen Creek and Little River)
- Alternative water strategies that include the Bedias Dams/transfer project which will impact the west fork of the San Jacinto river bottomland hardwood forested wetlands/Sam Houston National Forest.

Thank you again for the opportunity to provide input.

Barb Swartz

Barbara Swartz,
President, League of Women Voters Houston area



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Ms. Barbara Swartz
President, League of Women Voters Houston Area
2650 Fountain View, Suite 328
Houston, Texas 77057-7631

Re: Initially Prepared 2006 Region H Water Plan

Dear Ms. Swartz:

The Region H Water Planning Group (RHWPG) appreciates the comments and input of the League of Women Voters on the Initially Prepared 2006 Region H Water Plan. We appreciate your interest both in the plan and in the planning process. Your comments will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. Thank you again for making your views known.

Sincerely,

Jim R. Adams, P.E.
Chair, Region H Water Planning Group

Cy-Fair Area Democrats Club

Jim Adams, PE
General Manager
San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305-0329

Dear Mr. Adams:

Enclosed please find a resolution passed by the members of the Cy-Fair Area Democratic Club (CFADC). Our Environmental Committee expanded on a resolution submitted to the club by the Harris County Democratic Party. We wanted to include provisions for more citizen oversight in the Region H Water Planning Group and also contribute specific suggestions for the ways we would like our mud district taxes spent. The main author of the resolution is James Kain, PE, an environmental engineer for TRC Solutions.

Please ask the members of the planning group to consider the resolution when making plans for the region's water use. If you have any questions about the recommendations in the resolution, feel free to call Jim at (713) 821-6049.

Sincerely,
Kathleen Kain
President
Cy-Fair Area Democrats Club
14707 N. Eldridge Parkway
Houston TX 77070
(281)376-7066
kkain1@earthlink.net

RESOLUTION REGARDING REGIONAL WATER MANAGEMENT PLAN

WHEREAS Harris County, Texas is the third largest populated county in the United States with about 2 million voters and 3 million residents;

- Harris County has 22% of the roll call in seven (7) of the 31 Senate Districts in Texas; the counties in these districts include Brazoria, Chambers, Fort Bend, Galveston, Harris, Jefferson, Montgomery, and Orange. These counties politically define the 'Houston Region';

- The City of Houston is the 4th largest city in the United States; it is the home to the petrochemical industry, NASA, more than 16 institutions of higher learning and the largest medical complex in the world;

- The surface and near-surface groundwater in the Houston Region are polluted with urban and industrial chemicals and waste;

- The Houston Region is subject to natural geological ground subsidence and land subsidence increases with groundwater production;

- Special Subsidence Districts have been created to manage groundwater production within Harris, Galveston and Fort Bend counties;

- Regional water and transportation plans have been created for Harris and adjacent counties within the Houston Region.

BE IT THEREFORE RESOLVED THAT the Harris County Democratic Party supports:

- Good management of the Region H Water Plan and the Regional Transportation Plan to increase the quality of human health and welfare, to protect the environment and ecological habitats as a priority criteria, and to reuse and recycle limited water resources. Increased voting representation of at least five public at-large members from each affected regional county shall be included in the Region H Water Planning Group, with such members not affiliated with industrial, agricultural, municipal, government, or utility district water user groups.

- Appropriate and high human life and health science-based standards for regulating both surface and underground drinking water supplies. The Region H plan shall avoid the expanded use of groundwater through regulated withdrawal caps on groundwater use and the development of groundwater conservation districts as necessary to enforce such limits. Promoted projects shall focus on irrigation conservation, industrial conservation, wastewater reclamation for industry, direct and indirect water reuse with any health risks being addressed, aquifer recharge, the limiting of additional purchases of industrial user water rights that could impact municipal supplies during drought events, and sea water desalination. Industrial water use constraints shall apply simultaneously whenever public community water drought indoor constraints are implemented.

- Green-space for parks, recreation, floodwater management, and wetlands protection within the region shall be priority concerns. Conveyance transfer projects to enable the City of Houston to transfer water to Lake Houston and reservoir projects to enable other city, river, and water authorities to have adequate surface water supplies shall be priorities. The plan should ensure maintenance of minimum environmental flow requirements to ensure a healthy Galveston Bay ecology if possible. Mandatory public review and approval shall be required for interbasin water transfers within Region H, municipal or utility district water conservation and drought management plan constraints and penalties, new construction flood damage liability limits, and funding alternatives.

- Continued funding with accounting oversight of the Regional water planning process to develop an environmental economic specification for Region H water and transportation projects funded with state, Federal, and industrial revenue to include human health and ecological environmental assessments to protect public health, property, and the environment; preliminary engineering design and development of detailed engineering cost estimates for recommended facilities or improvements; and public education programs to stimulate public review, approval, and adoption of the plan details. Federal funding and grant programs shall be pursued where possible. State loan programs and State Revolving Fund programs should be increased to provide financing for Region H projected municipal and industrial growth and water needs.

Revised by Environmental Initiative of the Houston Region Democrats **6/30/05**

Submitted to: Region H Water Planning Group

Submitted by Cy-Fair Area Democratic Club date 8/8/05

County Harris Pct _____ Senate District 7

August 23, 2005

Ms. Kathleen Kain
President, Cy-Fair Area Democrats Club
14707 N. Eldridge Parkway
Houston, Texas 77070

Dear Ms. Kain:

The Texas Water Development Board (TWDB) welcomes public input regarding methods and assumptions applied in state and regional water planning. Thank you for providing us a copy of your comments on Region H's draft 2006 regional water plan, the regional planning process as implemented by Region H, and suggestions for the region's priorities. The Planning Group must consider your comments when revising their plans prior to final adoption and submittal to TWDB by January 2006.

Copies of the Club's resolution and this response will be forwarded to the Region H Water Planning Group.

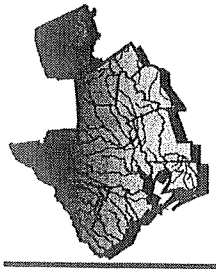
If we can be of any assistance, please contact me at 512/ 475-0933 or Mr. Bill Roberts of my staff at 512/ 936-0853.

Sincerely,

Carolyn L. Brittin
Director, Water Resources Planning Division

c: Jim Adams, Region H

P.O. Box 13231 • 1700 N. Congress Avenue • Austin, Texas 78711-3231
Telephone (512) 463-7847 • Fax (512) 475-2053 • 1-800-RELAYTX (for the hearing impaired)
URL Address: http://www.twdb.state.tx.us • E-Mail Address: info@twdb.state.tx.us
TNRIS - The Texas Information Gateway • www.tnris.state.tx.us
A Member of the Texas Geographic Information Council (TGIC)



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Ms. Kathleen Kain
President, Cy-Fair Area Democrats Club
14707 N. Eldridge Parkway
Houston, Texas 77070

Re: Initially Prepared 2006 Region H Water Plan

Dear Ms. Kain:

The Region H Water Planning Group (RHWPG) appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan. We appreciate your interest both in the plan and in the planning process. We take particular note of your recommendation of increased "at-large" representation on the planning group. Your comments and the resolution prepared by your club will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. Thank you again for making your views known.

Sincerely,

Jim Adams

Jim R. Adams, P.E.
Chair, Region H Water Planning Group

WRITTEN COMMENTS ON THE INITIALLY PREPARED PLAN SUBMITTED TO THE REGION H WATER PLANNING GROUP

The Region H Water Planning Group welcomes public comment. If you wish to submit written comments, please provide the information requested below and return this form to a consulting team member. This form may also be submitted by mailing it to Jim Adams, Chair, RHWPG, c/o San Jacinto River Authority, P. O. Box 329, Conroe, Texas 77305. Comments must be received by September 16, 2005.

NAME: Tamara Shelby

AFFILIATION: none

ADDRESS: 7215 Airport Blvd Houston, Texas 77061-3914
City State Zip

713 641 2992 | none | tamarashelby@sbcglobal.net
Telephone Fax E-Mail

COMMENTS:

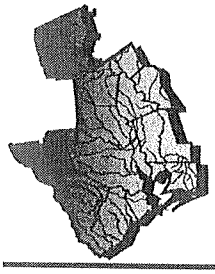
1. Concerned as much about the Quality of wastewater return flow as the Volume of same - lead level of prime concern

2. With changing weather patterns adjustment to worst droughts on record should be considered so as not to fall short of water supplies

3. water for the environment/wildlife should also be factored into the plan

4. Industrial conservation could be achieved through cost, for water consumption. Controls

Date: Signed:



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Ms. Tamara Shelby
7215 Airport Blvd.
Houston, Texas 77061-3914

Re: Initially Prepared 2006 Region H Water Plan

Dear Ms. Shelby:

The Region H Water Planning Group (RHWPG) appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan. Your comments about water quality, drought of record, water for the environment and wildlife, and industrial water conservation will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. Thank you again for making your views known.

Sincerely,

Jim Adams

Jim R. Adams, P.E.
Chair, Region H Water Planning Group

WRITTEN COMMENTS ON THE INITIALLY PREPARED PLAN SUBMITTED TO THE REGION H WATER PLANNING GROUP

The Region H Water Planning Group welcomes public comment. If you wish to submit written comments, please provide the information requested below and return this form to a consulting team member. This form may also be submitted by mailing it to Jim Adams, Chair, RHWPG, c/o San Jacinto River Authority, P. O. Box 329, Conroe, Texas 77305. Comments must be received by September 16, 2005.

NAME: Sarah Metzger

AFFILIATION:

ADDRESS: P.O. Box 672 (City) Pasadena (State) TX (Zip) 77501

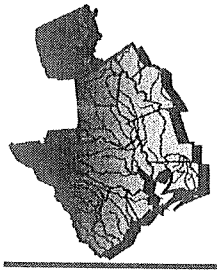
(Telephone) | (Fax) | smetzger@ci.pasadena.tx.us (E-Mail)

COMMENTS: Return flows in the upper water bay [illegible] could be degraded quality. If this is the case, the return flow could actually damage the ecology of the bay

Some interplay between return flow quantity and the reuse of return flow by industry might need to be addressed.

Recommend that school programs - very agressive - be implemented by state + a blitz type media campaign be initiated to educate public about residential water conservation.

Print: Signed:



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Ms. Sara Metzger
P. O. Box 672
Pasadena, Texas 77501

Re: Initially Prepared 2006 Region H Water Plan

Dear Ms. Metzger:

The Region H Water Planning Group (RHWPG) appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan. Your comments about water quality, water reuse, and the need for public education on water conservation will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. Thank you again for making your views known.

Sincerely,

Jim Adams

Jim R. Adams, P.E.
Chair, Region H Water Planning Group

SIERRA CLUB
FOUNDED 1892

Houston Regional Group
~~P. O. Box 3021~~
Houston, Texas ~~77253-3021~~
~~713-895-9309~~
http://texas.sierraclub.org/houston/

August 12, 2005

Mr. Jim Adams, P.E.
General Manager
San Jacinto River Authority (SJRA)
P.O. Box 329
Conroe Texas 77305-0329

and

Mr. J. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Adams and Mr. Ward,

Enclosed are additional comments of the Houston Regional Group of the Sierra Club (HSC) regarding the draft Region H Water Plan (RHWP) as developed by the Region H Water Planning Group (RHWPG).

The comments stem from the August 11, 2005 public meeting that was sponsored by Region H, the Lone Chapter of the Sierra Club, and the Galveston Bay Foundation. We enjoyed attending this meeting, listening, and talking to the nearly 60 people that filled the room. More meetings like this associated with important Region H topics would be beneficial to the public. We encourage Region H and the Texas Water Development Board (TWDB) to support this type of open, public, forum for water issues.

1) The HSC urges Region H to use a model that projects the possible instream and inflow impacts on important streams and Galveston Bay if Region C is not able to construct one or more of the dams that they are considering. For instance, there is a lot of public opposition to Marvin Nichols and Fastrill (Weches) dams. There also is a lot of public opposition to Rockland Dam in Region I, whose water could be used by Region C. Finally, the effects that the State of Louisiana will have on withdrawal of water from Toledo Bend Dam should be determined and modeled for bay inflows.

2) The HSC urges Region H to conduct whatever modeling is required to determine the ecological and biological consequences of redistributing water

from the Trinity River to the San Jacinto River and thus changing the hydrological regime of Galveston Bay. The Trinity River Delta and Trinity Bay are particularly rich in ecological and biological values. These areas need to be protected, preserved, and conserved and Region must accept the responsibility and hold itself accountable for them to survive and thrive.

3) The HSC urges Region H to require that existing supplies of water, which are diverted and used, be returned to the same stream in a similar amount. In this way we will perpetuate the instream flows and the proportion of instream flows that historically or naturally flowed into Galveston Bay and created the ecological and biological values of each bay inflow area. This will protect the health of Galveston Bay.

4) The HSC urges Region H to create a water conservation goal for industrial water users. Because it is not clear the amount of water that industry can conserve, the so-called black box, the HSC recommends a modest goal of 5-10% reduction in use for each industry that uses more than a certain amount (trigger) of water. Analysis of industrial water use by consultants would result in a recommended trigger for Region H to consider and approve.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt Mannchen
Chair, Forestry Subcommittee
Houston Regional Group of the Sierra Club
5431 Carew
Houston, Texas 77096
713-664-5962

October 31, 2005

Mr. Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew St.
Houston, TX 77096

Subject: Response to Additional Comments on the Initially Prepared 2006 Region H Regional Water Plan.

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan (IPP). The following letter provides responses to the comments you provided in your letter dated August 12, 2005.

1) The Houston Sierra Club (HSC) urges Region H to model instream and bay and estuary inflows, including flows into Galveston Bay and Sabine Lake, to reflect potential changes to the Region C management strategies.

The flow modeling for the 2006 Region H Water Plan was based on the strategies in the 2002 State Water Plan, and was conducted before the 2006 water management strategies were selected. For the next planning cycle, the model can be updated to reflect the 2007 State Water Plan. Modeling of Galveston Bay inflows was conducted by Region H. Modeling of Toledo Bend Reservoir and the Sabine River Basin was conducted by the East Texas Water Planning Group (Region I). Finally, the TWDB is now in the process of using the recommended management strategies from the various IPP's to conduct additional WAM modeling for all of the state and anticipates making that data available to the regions sometime next year.

2) The Houston Sierra Club (HSC) urges the RHWPG to conduct whatever modeling is required to determine the ecological and biological consequences of redistributing water from the Trinity River to the San Jacinto River.

The RHWPG appreciates your suggestion and will recommend appropriate additional analysis of these issues in the scope for the next planning cycle.

3) The Houston Sierra Club (HSC) urges Region H to require that existing supplies of water which are diverted and use be returned to the same (source) stream in a similar amount.

This suggestion suggests that clarification is needed regarding several issues. First, Region H is strictly a planning entity and cannot "require" return flows in any amount for diversions permitted by TCEQ which already have been granted conditions allowing full consumptive use. Region H can recommend a plan which does not include use of wastewater return flows and consequently create difficulties for any entity which might need additional or revised state permits or state funding for such management strategies. However, for typical municipal, industrial, and agricultural diversions, a significant quantity of the permitted diversion will be consumed and will not be available to return to the stream "in a similar amount" under even the best scenario.

Because of the region's continued reliance on groundwater and the importation of water from other basins, there is the likelihood that most local source streams will not experience any significant diminution of instream flow, even under the increased use of return flows recommended within the plan. Additional quantitative analysis of this condition has been added to the plan to address this issue. Protection for the basin-of-origin must also be accomplished and that is an additional issue which will be addressed during the permitting process in both the Trinity and Brazos Basins for future inter-basin diversion permits and is also recommended to be addressed in more detailed analysis for existing permits during the next round of planning..

4) The Houston Sierra Club (HSC) urges the RHWPG to create a water conservation goal of 5-10% for industrial water use.

The RHWPG appreciates your suggestion and agrees that this would be a desireable "goal". However, as previously addressed in response to similar comments, there is a lack of sufficient data to support use of this goal within the plan at this time. The RHWPG will continue to encourage aggressive water conservation for all uses of water within Region H, but has elected not to incorporate more conservative assumptions in the expectations for industrial water use in this round of planning.

Thank you for your comments.

Sincerely,

David Parkhill, P.E.
Project Principal

Attachments: Sierra Club Letter Dated July 17, 2005

c: Region H Water Planning Group
Region H Consultant Team

August 22, 2005

Mr. Jim Adams, P. E.
General Manager
San Jacinto River Authority
P. O. Box 329
Conroe, TX 77305

Dear Jim:

I am having a budget planning session tonight to discuss the long term water supply for Willis. As I was reviewing the email from Andrew Sterbenz, I was struck by his data. He says our average daily demand for water is 378,000 GPD. That may have been in 2000 when the population was less than four thousand people, but today we have 5,000+ and our GPD is 660,000. If we do quadruple our population by 2060 as projected in Sterbenz calculations, our demand then will be 2.6 MGD, not 1.6 as he predicts. I am confident this will affect the overall picture.

I intend to ask Council to consider putting $250,000 per year aside until 2020 when the transition will be made to a surface supply, versus a well field in South Walker County as the LSGWCD proposes for Willis. I was city manager in Huntsville in the 70's when we made the switch there to surface water with TRA.

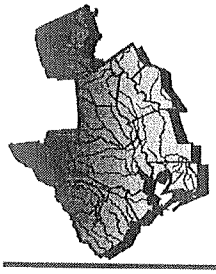
All of this is to say that we want to be kept informed of future meetings and plans for Willis and we can be counted as "very interested" in the long term solution.

Just keeping you in the loop.

Sincerely,

Jim McAlister
City Administrator

City of Willis
P. O. Box 436 • Willis, Texas 77378
(936) 856-4611 • Fax (936) 890-1246



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Mr. Jim McAlister
City Administrator
City of Willis
P. O. Box 436
Willis, Texas 77378

Re: Initially Prepared 2006 Region H Water Plan

Dear Mr. McAlister:

The Region H Water Planning Group (RHWPG) appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan. Your comments about your future water supply will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. We welcome your attendance at future meetings and thank you again for making your views known.

Sincerely,

Jim R. Adams, P.E.
Chair, Region H Water Planning Group

James H. F. Williams
4394 Fiesta Lane
Houston, Texas 77004
Home Phone 713 748 8133
August 28, 2005

Mr. Jim Adams, P.E., General Manager, SJRA
P.O. Box 329
Conroe, Texas 77305-0329

Subject: Region H Water Plan

Dear Mr. Adams:

This letter is to let you know that I **support** the following:

1) Sufficient freshwater inflows for optimal year-round habitat and protection in rivers/streams and in Galveston Bay/other bays/estuaries to ensure that fish, wildlife, riparian woodlands (streamside vegetation), bottomland hardwood forested wetlands, and other sensitive areas.

2) Strong water conservation requirements for residential, municipal, commercial, industrial, and agricultural uses.

3) Reuse of water return flows with guarantees that rivers/streams and bays/estuaries are not harmed by this reuse.

4) The designation of the 8 ecologically unique stream segments (Armand Bayou - Harris Co., Austin Bayou - Brazoria Co., Bastrop Bayou -Brazoria Co., Big Creek- Fort Bend Co., Big Creek - San Jacinto Co., Cedar Lake Creek - Brazoria Co., Menard Creek - Liberty, Hardin, and Polk Cos., and Oyster Bayou - Chambers Co.) that are in the Region H water plan.

5) Adding additional ecologically unique stream segments in Sam Houston National Forest including Caney Creek, East Sandy Creek, Briar Creek, Boswell Creek, Henry Lake Branch, West Sandy Creek, Little Lake Creek, Winters Bayou, Harmon Creek, and the East and West Forks of the San Jacinto River; the Trinity River, Old River, and Lost River that flows through the Wallisville Area; East Bay Bayou and Onion Bayou that flows through Anahuac National Wildlife Refuge; the Trinity River that flows through the Trinity River Wildlife Refuge; and the Brazos River that flows through Brazos Bend and Stephen F. Austin State Parks.

5) A survey of Texans/Houstonians to determine what they, their children, and grandchildren want by 2060 regarding Quality of Life, environmental health, population growth, and smart growth and how the doubling of population to 40 million will impact these desires. The Region H water plan should reflect these

desires and not simply build water projects to meet a projected population of 40 million.

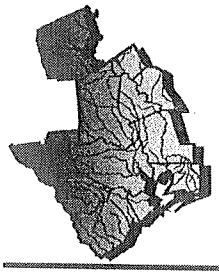
6) Requiring each significant water rights proposal going through a public amendment process which includes public notification, a 30-day public comment period, and a public hearing before deciding whether to add the water rights proposal to the Region H water plan.

I **oppose and want removed** from the Region H water plan, the Bedlas Dam/water transfer alternative water management strategy and the East Texas Water Transfer (Sabine/Neches Rivers) future water management strategy, because they will have unacceptable environmental impacts on fish, wildlife, streamside vegetation, bottomland hardwood forested wetlands, the West Fork of the San Jacinto River or the Neches and Sabine Rivers, Sam Houston National Forest or Big Thicket National Preserve, and Galveston Bay or Sabine Lake.

Sincerely,

James H. F. Williams

James H. F. Williams



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Mr. James H. G. Williams
4394 Fiesta Lane
Houston, Texas 77004

Re: Initially Prepared 2006 Region H Water Plan

Dear Mr. Williams:

The Region H Water Planning Group (RHWPG) appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan. Your comments about water for environmental purposes, water conservation, water reuse, designation of ecologically unique streams, and future quality of life in the region, and public review of water rights proposals will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. Thank you again for making your views known.

Sincerely,

Jim Adams

Jim R. Adams, P.E.
Chair, Region H Water Planning Group

WRITTEN COMMENTS ON THE INITIALLY PREPARED PLAN
SUBMITTED TO THE REGION H WATER PLANNING GROUP

The Region H Water Planning Group welcomes public comment. If you wish to submit written comments, please provide the information requested below and return this from to a consulting team member. This form may also be submitted by mailing it to Jim Adams, Chair, RHWPG, c/o San Jacinto River Authority, P.O. Box 329, Conroe, Texas 77305. Comments must be received by September 16, 2005.

NAME: Jerry Lovelady

AFFILIATION: Porter Special Utility District

ADDRESS: 22162 Water Well Road, Porter, Texas 77365

Telephone: 281-354-5922 Fax: 281-354-5050 E-Mail: jerrylovelady2001@yahoo.com

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COMMENTS:

- Emphasis should be placed on Water Conservation (with both "hard" and "soft" water conservation measures) for a substantial water consumption reduction across Region H.

- Conservation Credits should be issued by the Conservation Districts/Agencies (throughout the Region H area) to Water Utilities that achieve measurable and quantifiable water supply reductions.

- Water Consumption should be measured in the State of Texas on a per-metered-service-connection basis (as divided into residential consumption, commercial, institutional, etc.) – not on a per-capita basis [i.e., unincorporated utilities – such as MUDs and SUDs - do not have accurate population numbers, and the per-connection basis (as utilized by TCEQ) is more accurate].

- A "Water Conservation Task Force" (with Members from the various Water Utilities and from the general population) should be established by Region H to assist in the Region's water conservation efforts.

- Region H should establish formal lines of communication with the Regional Water Providers across Region H, as related to provision of surface water supplies to those Utilities that have no practical nor reasonable means of obtaining surface water.

Date: September 9, 2005 Signed: Jerry Lovelady

October 31, 2005

Mr. Jerry Lovelady
Porter Special Utility District
22162 Water Well Road
Porter, Texas 77365

Subject: Response to Comments on the Initially Prepared 2006 Region H Regional Water Plan.

Dear Mr. Lovelady:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan (IPP). The following letter provides responses to the comments you provided in your letter dated September 9, 2005.

1) Emphasis should be placed on Water Conservation.

The RHWPG agrees and may increase the emphasis in the final plan.

2) Conservation Credits should be issued by the Conservation Districts/Agencies to Water Utilities that achieve measurable reductions.

The RHWPG will share this recommendation with the Subsidence and Groundwater Conservation Districts in the Region.

3) Water consumption should be measured on a metered use basis, not on a per-capita basis.

Water use IS measured on a metered use basis. That use is then aggregated and reported to the TCEQ and the TWDB. The TWDB and the State Data Center estimate water district populations based on CCN boundaries and census tracts, and then determine per-capita use rates. These rates are only used to project future water demands, based on projected population growth.

4) A "Water Conservation Task Force" should be established within Region H.

The TWDB requested, but was not funded for, a water conservation coordinator to assist the planning regions. The RHWPG will consider forming a Conservation Sub-Group during the next planning cycle.

5) Region H should establish formal lines of communication with the Regional Water Providers.

Most of the Regional Water Providers are represented on the Region H Planning Group, to include the city of Houston, the San Jacinto River Authority, the Trinity River Authority and the Brazos River Authority. If a local utility district needs to contact a regional water provider, they may contact any planning group or consultant team member, and they will be happy to assist in contacting the appropriate office.

Thank you for your comments.

Sincerely,

David Parkhill, P.E.
Project Principal

c: Region H Water Planning Group
Region H Consultant Team

bpa bayou preservation association

September 13, 2005

Jim Adams, PE
General Manager
San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305-0329

J. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Re: Public comments on Region H 2006 Water Plan

Dear Mr. Adams and Mr. Ward:

The Bayou Preservation Association (BPA) has been advocating for healthy and ecologically complete streams and bayous for almost 40 years. We appreciate the opportunity to comment on the 2006 Region H Water Plan.

Unique Stream Segments

The BPA supports the preservation of Unique Stream Segments and agrees with the stream designations recommended by Region H. Armand Bayou, Austin Bayou, Bastrop Bayou, Big Creek-Fort Bend, Big Creek-San Jacinto, Cedar Lake Creek, Menard Creek and Oyster Bayou should be designated as Unique Stream Segments and protected from future reservoir development.

Water Conservation

The BPA strongly and fully supports the need for water conservation in all Water User Groups (WUGs), not just those with identified water shortages. We believe the planning guidelines should be changed to require all WUGs to reduce their water use through appropriate conservation activities and applaud the City of Houston for including its demand reductions in the Plan. However, we feel that the goal of an approximate 7% reduction in general water use by the Region H WUGs with water shortages could be significantly higher. (The City of Albuquerque has a goal of 40% reduction by 2014; Marin County in California was able to achieve 60-80% reductions after experiencing several drought years). We do support the strategy of wastewater reclamation for industries along the Houston Ship Channel and the other general strategies for new water supplies that have an acceptable environmental impact for the region with one major exception as explained further below.

bpa bayou preservation association

Wastewater Reuse

Our principal concern within the proposed Region H Plan is with the strategy of significantly increased wastewater reuse. We do not support the City of Houston's application to indirectly reuse up to 580,900 ac-ft/yr of wastewater discharges which is essentially all the dry weather flow of Buffalo, Brays, White Oak and Sims Bayous. We request that a portion of this flow be set aside for instream use and as fresh water supply to Galveston Bay. Historically these bayous had a spring-fed base flow that has been eliminated by channel deepening and urbanization of the watersheds. The ecosystems that are supported in these watersheds are now totally dependent on wastewater flow during extended dry periods. Data from the *Technical Summary of the TMDL for Fecal Pathogens in Buffalo and Whiteoak Bayou* show that the variation in flow has decreased, and the amount of flow has increased over the past 70 years. While seasonal decreases in base flow would mimic natural flow, a large reduction in overall dry weather flow would adversely affect an entire ecosystem. Reduced flows would affect water temperature, depth, salinity, velocity, sediments, dissolved oxygen levels and nutrients. A discussion of the effect of changes in hydrology on various species is provided below.

Fish Habitat - Flow affects fish spawning and rearing habitat. Changes in temperature, depth, dissolved oxygen levels and salinity will affect fish as well. The USGS Fish, Benthic Macroinvertebrate and Stream Habitat data from 1997-98 documented these organisms in several regional bayous. Areas in Buffalo and White Oak Bayous were included in this study. The following species of fish were found in Buffalo Bayou: Bowfins, Gars, Herrings, Minnows, Suckers, Catfish, Livebearers, Temperate basses, Sun Fishes, Mullets, and Drums. White Oak Bayou had the following species: Minnows, Catfish, Livebearers, Sunfishes, and Cichlids. Twenty four different taxa of benthic macroinvertebrates were also found in Buffalo Bayou and sixteen different taxa were found in White Oak Bayou. While mussels were not studied, velocity affects their growth and reproduction. Mussels are considered a good target species due to their sensitivities to changes in water quality and quantity.

Bird Habitat - A change in flow can alter tree species that affects nesting and foraging habitat of birds. The January 2, 2005 Buffalo Bayou Christmas Bird Count observed 127 species in this watershed. This large number of species is due to the parks and natural areas along Buffalo Bayou. Some of the species observed were Little Blue Heron, White Ibis, Black-bellied Whistling-Duck, Blue-winged Teal, Vermilion Flycatcher, Blue-headed Vireo, American Robin, Gray Catbird, Cedar Waxwing and American Goldfinch. Although we do not have data for bird counts along the other bayous, even concrete lined bayous support some bird species.

Trees - The exchange of water between bayous and their floodplains is critical for the growth of healthy riparian trees. Reduction in flow also affects the quantity and quality of nutrients and energy that are available to trees in the remaining natural channels. Flow is necessary for the transport of seeds

bpa bayou preservation association

and for germination and maintenance of riparian growth. While most of our bayous have been infested with invasive species, much diversity still remains. Green ash, Sycamore, Bald cypress and numerous oaks are examples of the trees that edge the natural streams.

Reptiles and Amphibians - Lower flows can reduce the abundance of reptiles and amphibians as habitat is reduced. Amphibians are also very sensitive to water contaminants that can concentrate in low flow conditions. A variety of frogs, turtles and snakes have been observed in Buffalo Bayou.

Mammals - Mammals are dependent on healthy riparian buffers that provide habitat, food and nesting areas. Although there are no recent studies on the mammals along these bayous, there is a large bat colony under a bridge that crosses Buffalo Bayou. Texas Parks and Wildlife is currently putting together teams to monitor and count this colony.

Recreation and Economic Development - Many streams within the Houston area of Region H have reaches that are suitable for water recreation, including Buffalo Bayou, Clear Creek, Cypress Creek, Spring Creek, West and East Forks of the San Jacinto River, Luce Bayou, Greens Bayou, the Brazos River, parts of White Oak Bayou, Hunting Bayou and Sims Bayou and many other smaller streams. The BPA maintains a web site that lists paddle trails in these bayous. Water levels are currently high enough to be navigable most of the year. The Houston Canoe Club and Buffalo Bayou Partnership regularly sponsor canoe trips on these bayous. A large reduction in base flow conditions due to wastewater reuse would curtail opportunities for recreation on our bayous. Buffalo Bayou also flows through the heart of downtown and is the focal point for economic development in the area.

Setting Limits for Wastewater Reuse - Inflow-based, condition-based or resource-based can all be used to define acceptable levels of dry weather flow. Wastewater flow is predicted to increase as the population increases. The BPA has participated in negotiations in the past where golf course owners and City of Houston Parks and Recreation Department have applied to remove water from Buffalo Bayou for irrigation purposes. In these instances the amount of flow to be withdrawn was condition-based. This method has worked well in these instances. It is easy to monitor and is protective of natural resources. The BPA recommends that this method also be used to maintain a minimum level of flow in the bayous that conserves natural resources and provides for recreational opportunities.

Sincerely,

Mary Ellen Whitworth

Mary Ellen Whitworth, P.E.

October 31, 2005

Ms. Mary Ellen Whitworth
Bayou Preservation Association
P.O. Box 131563
Houston, TX 77219-1563

Subject: Response to Comments on the Initially Prepared Region H 2006 Water Plan.

Dear Ms. Whitworth:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan (IPP). The following letter provides responses to the comments you provided in your letter dated September 13, 2005.

1) The Bayou Preservation Association (BPA) supports the recommendation to designation eight streams of Unique Ecological Value.

The RHWPG appreciates your support.

2) The BPA strongly and fully supports water conservation for all WUGs, not just those with identified water shortages. They believe that the conservation goal should be greater than the 7% reduction listed in the plan, and cites several cities that achieved reductions of 40% or more.

The RHWPG advocates water conservation for all WUGs, and will consider establishing a goal for conservation. The 7% figure you quote from the plan comes from the water management strategy recommended to meet projected shortages. That strategy is based on a limited list of best management practices (BMP) that reliably produce a cumulative savings of 7%. That is different from establishing a goal, such as the City of Houston's target of 15%. The RHWPG has had long discussions about what a conservation goal means, and whether a goal in enforceable. Within the Regional Water Plan, we chose to be conservative in estimating projected savings, because the state currently has no enforcement method for water conservation.

Also, you cite the City of Albuquerque as having a goal of 40% reduction by 2014. Please note that in 1994 when that conservation program began, the city's usage rate was 250 gallons per capita day (GPCD), is currently at 177 gpcd, and the City receives 10-inches of annual rainfall. The City of Houston, by comparison, has a usage rate of 159 gpcd and annual rainfall of 51-inches. You also cite Marin County, CA, as achieving high conservation rates. Please note that Marin County considered wastewater reuse a water conservation measure, and not a separate water management strategy.

3) The BPA is concerned that wastewater reuse would reduce return flows to the point that Buffalo, Brays, Sims and White Oak Bayous would not flow during dry periods.

In response to BPA and several others asking about the impacts of wastewater reuse on stream flows, we have estimated the future return flows (as a function of projected municipal water demand), and looked at the resulting flows after reuse diversions. What we find is that Harris County produced about 360,000 acre-feet of wastewater in the year 2000. In 2020, it is projected to produce 424,000 acre-feet, with

67,000 acre-feet of that going to reuse. That leaves 357,000 acre-feet for the bayous (a difference of 1%). In the year 2050, the projected wastewater volume is 500,000 acre-feet, the reuse is 165,000 acre-feet, and the streams get 335,000 acre-feet (91% of current discharges). While the Region H Water Plan recognizes all return flows as *potential reuse*, the plan conservatively recommends using only 20% of the listed potential sources.

Thank you for your comments.

Sincerely,

David Parkhill, P.E.
Project Principal

c: Region H Water Planning Group
Region H Consultant Team

Brazos River Authority

QUALITY • CONSERVATION • SERVICE

September 13, 2005

Mr. Jim Adams, P.E.
General Manager
San Jacinto River Authority
P.O. Box 329
Conroe, TX 77305

Dear Mr. Adams:

The Brazos River Authority (BRA) would like to thank you for your leadership and efforts in guiding the development of the Initially Prepared 2006 Region H Water Plan. Additionally, we wish to express our appreciation for the dedication and commitment of all those involved in developing the Plan, particularly each of the planning group members, the Texas Water Development Board, and the consulting team. The BRA looks forward to the opportunity and challenge of meeting future water supply needs in Region H as recommended in the Plan.

We have completed a review of the Initially Prepared Plan with particular focus on aspects of the Plan that are associated with BRA's water supply system and service area. We offer the following comments and suggestions for consideration in finalizing the Plan.

- Page E-17 and Table 1-1 on page 1-5: Tony Jones is no longer a member of the Brazos G RWPG. The new Region G member who has been assigned to act as the liaison to Region H is Wayne Wilson, who represents Agriculture on the Brazos G RWPG.

- Table E-9, page E-25, and Table 3-12, page 3-46: Clarify footnote 1 to indicate that current BRA contracts only represent a portion (about 138,913 AF as shown in Table 3-4) of the 611,106 acre-feet total, the rest being other water rights.

- Page 1-29: Suggest adding a subtitle distinguishing strategies resulting from the 2001 Plan Amendment from strategies originally recommended in the 2001 Plan.

- Table 3-5, page 3-25: BRA is in the process of coordinating with Region G regarding sedimentation rates used to estimate the 2060 capacity for several of the BRA reservoirs. We will coordinate any necessary changes to this table at a later date if changes are made to any of the sedimentation rates used for the Initially Prepared Region G Plan.

- Table 3-7, page 3-32: Remove the statement "...condition lasts 1 day" from the description of BRA Drought Watch and Warning Trigger Condition and Duration.

4600 Cobbs Drive • P.O. Box 7555 • Waco, Texas 76714-7555
254-761-3100 • FAX 254-761-3215

- Appendix 3C: Information currently presented is from BRA's old drought plan. Update page 1-7 and 6-7 based on new drought plan.

- Section 4.2.1, page 4-4: Add Brazos Saltwater Barrier to bullet list.

- Section 4.3.2, page 4-12, paragraph immediately below Table 4-4: Suggest adding language regarding the Brazos Saltwater Barrier to the effect that while no yield is technically created, this project would allow upstream reservoir yield (16,000 AF/yr contract between BRA and Dow) to be conserved and made available for other needs.

- Page 4B2-2, DESCRIPTION: Need to update this paragraph. Information currently presented is outdated. See page 4B22-1 for current information.

- Page 4B16-1, UNIT WATER COST: Suggest adding a footnote stating that while the unit cost for development of this supply is estimated at $2.50/acre-foot, all surface water sold by BRA is at System Rate, which is currently $49.65/acre-foot.

- Section 7.1.6, page 7-3: Suggest rewording the first sentence as follows "...in the state (after the Rio Grande), primarily serving Regions O, G, and H."

- Page 4B23-1: Need to incorporate updated technical analysis performed by Region G following this page.

- General comment – review Figures and reformat as necessary to ensure legends and text are legible (example of one that is difficult is Figure 3-10, page 3-41).

Please do not hesitate to contact us regarding questions or clarification pertaining to any of these comments and suggestions.

Sincerely,

JOHN BAKER
Regional Manager, Central & Lower Basins

JB:kld
R:\Lower Basin\Baker\Comments on RegH 2006 IPP 083005.doc

October 31, 2005

Mr. John Baker
Brazos River Authority
Regional Manager, Central & Lower Basins
4600 Cobbs Drive
Waco, TX 76714-7555

Subject: Response to Comments on the Initially Prepared 2006 Region H Regional Water Plan.

Dear Mr. Baker:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan (IPP). We will incorporate your specific corrections in the text of the final plan. Because the Brazos G plan is also going through the review and comment period, we will keep the Little River Reservoir studies from the 2001 plan in the Region H technical memoranda, but update the cost data per the current Brazos G plan, and cite the appropriate chapter in the Brazos G plan for the reader to review the current work.

Sincerely,

David Parkhill, P.E.
Project Principal

c: Region H Water Planning Group
Region H Consultant Team

TEXAS PARKS & WILDLIFE

September 14, 2005

Jim Adams, PE
General Manager
San Jacinto River Authority
P.O. Box 329
105 Damsite Road
Conroe, TX 77305

Dear Mr. Adams:

Thank you for the opportunity to review and comment on the 2005 Initially Prepared Regional Water Plan (IPP) for Region H. Texas Parks and Wildlife (TPWD) acknowledges the time, money and effort required to produce the regional water plan as mandated by Senate Bill 1 of the 75th Legislature. A number of positive steps have been taken since the first planning cycle to advance the issue of environmental protection. For example, the regional water planning groups were faced with a new requirement under 31 TAC §357.7(a)(8)(A), to perform a "quantitative reporting of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico" when evaluating water management strategies. TPWD recognizes that each region's unique natural resources, water management strategies and funding limitations dictated the level of quantitative analysis for each regional plan. Nonetheless, TPWD feels strongly that quantification of environmental impacts is a critical step in planning for our state's future water needs while also protecting environmental resources.

TPWD staff has reviewed the IPP to determine if the following questions were addressed:

- Does the plan include a quantitative reporting of environmental factors including the effects on environmental water needs, habitat?
- Does the plan include a description of natural resources and threats to natural resources due to water quantity or quality problems?
- Does the plan discuss how these threats will be addressed?
- Does the plan describe how it is consistent with long-term protection of natural resources?
- Does the plan include water conservation as a water management strategy? Reuse?
- Does the plan recommend any stream segments be nominated as ecologically unique?
- If the plan includes strategies identified in the 2000 regional water plan, does it address concerns raised by TPW at that time?

The Region H IPP includes a quantitative reporting of environmental factors. Chapter 4.5 quantitatively describes potential impacts to freshwater inflows to Galveston Bay than may result from implementation of not only Region H proposed strategies but also Region C proposed strategies. This analysis was conducted using the Texas Commission on Environmental Quality Water Availability Models (TCEQ WAMs) to determine the cumulative impact of existing and future water development on frequencies of meeting freshwater inflow targets as recommended by the Galveston Bay Freshwater Inflow Group (GBFIG).

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TPWD supports this approach and would recommend this approach for other regional water planning groups. According to the IPP, monthly freshwater inflow targets are met at levels approaching or exceeding the GBFIG frequency goals for all but the "no return flows" scenario. This analysis also revealed a spatial shift in where freshwater inflows will be delivered to Galveston Bay in the future. The portion of inflows delivered to Galveston Bay from the San Jacinto Basin will increase while the portion from the Trinity Basin will decrease. This is largely due to increasing return flows in the San Jacinto Basin. While the Region H IPP acknowledges environmental flow needs, it does not necessarily plan for future environmental flow needs. The Executive Summary states "The RHWPG has endorsed GBFIG's recommendations, and supports further efforts to develop strategies for meeting the freshwater needs of both humans and the bay."

Additional quantitative measures are included in Table 4A-4. This table describes potential environmental impacts such as alteration of instream flows, wildlife habitat, and wetlands and lists threatened or endangered species that may be impacted. Finally, Table 4A-4 addresses cultural resources and whether or not Environmental Planning Criteria were used to estimate environmental flow needs. This type of table is the first step for presenting quantitative measures in a way that allows planners to adequately evaluate options from an environmental perspective. TPWD recommends this type of analysis be used elsewhere and enhanced to include information regarding societal costs so that cost/benefit analyses can be performed in future water planning.

Chapter 7.1 of the Region H IPP describes natural resources including threatened and endangered species and parks and public lands. Also included is a discussion of impacts of water management strategies on unique stream segments and on Galveston Bay. Chapter 5 addresses recreational activities associated with water in Region H. Finally, Appendix 7C presents the TPWD "Analysis of Water Management Strategies Recommended in the 2001 Region H Water Plan" that describes in detail natural resources potentially affected by the proposed water management strategies. The introduction to Appendix C discusses the differences between the 2001 and 2006 IPPs, most notably the change in the Allen's Creek Reservoir configuration intended to avoid sensitive wetland habitat and the omission of Bedias Creek and Little River Reservoirs.

The Region H IPP recommends water conservation for all water user groups. However, only water savings due to conservation are calculated for water user groups with shortages. Nonetheless, municipal and agricultural conservation are expected to save 101,200 and 77,900 acre-feet per year, respectively. TPW especially supports the Region's consideration of brush control/management as an additional means of conserving water if done in a manner that can also benefit wildlife habitat. Wastewater reuse is also included as a water management strategy. It is interesting to note that the North Harris County Regional Water Authority strategy, if increased to 50% reuse of treated effluent, could replace the Luce Bayou Transfer as a proposed water management strategy. TPWD has expressed it's concerns regarding potential impacts posed by the Luce Bayou Transfer and would recommend further consideration of the NHCRWA increased reuse strategy. TPWD would caution, however, that potential instream flow impacts be addressed before adopting increased reuse as a strategy.

TPWD is pleased to see that the plan recommends nomination of 8 stream segments as ecologically unique. Region H is to be commended as the first planning group to take this initiative. TPWD stands ready to provide any additional supporting information necessary to designate these segments as unique.

The 2005 Region H IPP is a well written report that provides sufficient detail. While TPWD is pleased to see many of our earlier comments have been addressed, concerns remain

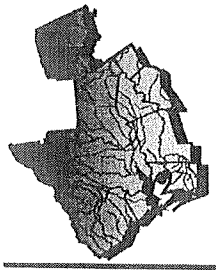
regarding potential impacts associated with several strategies. Consultation with TPWD staff will help to assure that fish and wildlife impacts can be avoided or minimized.

Thank you for your consideration of these comments. It is clear that the region is looking for opportunities and please be assured that TPWD will continue to work with the region to explore all possibilities to meet future water supply needs and assure the ecological health of the region's aquatic resources.

Sincerely,

Larry D. McKinney, Ph.D.
Director of Coastal Fisheries

LDM:CL:dh



REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Dr. Larry McKinney.
Director of Coastal Fisheries
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744-3291

Re: Initially Prepared 2006 Region H Water Plan

Dear Kr. McKinney:

The Region H Water Planning Group (RHWPG) appreciates the comments and input of the Texas Parks and Wildlife Department on the Initially Prepared 2006 Region H Water Plan. We also appreciate the participation of your staff and their assistance in providing needed information on the valuable natural resources in Region H. Your comments will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. Thank you again for making the views of TPWD known; we welcome your continued involvement.

Sincerely,

Jim Adams

Jim Adams, P.E.
Chair, Region H Water Planning Group

SIERRA CLUB
FOUNDED 1892

Houston Regional Group
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Houston, Texas 77253-3021
713-895-9309
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September 15, 2005

Mr. Jim Adams
Chair
Region H Water Planning Group
General Manager
San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305-0329

and

Mr. Andrew A. Sterbenz
Project Manager, Infrastructure
KBR
P. O. Box 3 (77001-0003)
4100 Clinton Drive, 03-1107G
Houston, Texas 77020-6237

Dear Jim and Andrew,

Enclosed are the comments of the Houston Regional Group of the Sierra Club (HSC) regarding the Region H Water Planning Group's (RHWPG) draft Wastewater Reclamation for Municipal Irrigation documents for the Region H Water Plan (RHWP).

Region H Water Management Strategy Analysis Technical Memorandum

1) **On page 1, Introduction,** the question of whether the RHWP should encourage uses of water, like irrigating golf courses and amenity lakes, in the future is not presented or discussed. There is no discussion about how golf courses and amenity lakes can conserve water or reuse the water they do use.

The HSC does not want to encourage water wasting activities. Watering green spaces, as long as not done wastefully, appears to be a more reasonable use because of the benefits that parks and green spaces provide for all citizens. Watering golf courses and amenity lakes are unnecessary water uses that should not be encouraged.

2) **On page 4, Table 1, Projected Potential Demands for Reclaimed Wastewater,** for Brazoria County, in 2060, the percent of wastewater reuse

demand for golf courses is 54.1%; for green spaces is 21.6%; and for amenity lakes is 24.3%.

For Fort Bend County, in 2060, the percent of wastewater reuse demand for golf courses is 71.7%; for green spaces is 13.3%; and for amenity lakes is 15.1%.

For Harris County, in 2060, the percent of wastewater reuse demand for golf courses is 50.8%; for green spaces is 23.1%; and for amenity lakes is 26.1%.

For Montgomery County, in 2060, the percent of wastewater reuse demand for golf courses is 76.6%; for green spaces is 12.5%; and for amenity lakes is 10.9%.

This type of profligate use should not be tolerated or encouraged by the RHWPG. Of the total demand for 2060 of 30,631 acre feet/year of wastewater reuse demand, 21,131 acre feet or 69.0% is slated for golf course watering. If amenity lake use is included in this figure then you have 25,947 acre feet or 84.7% of the total wastewater reuse demand. This demand must come down especially since these are uses that are not necessary and do not benefit much of the public.

3) **On page 7, Issues and Considerations,** there is no discussion especially about how much the loss of this water from stream flows will impact ecosystems, wildlife, fish life, aquatic life, etc. The environmental impacts and costs need to be analyzed and displayed with the so-called benefits and calculations for how to achieve this amount of wastewater reuse.

4) **On page 7, Issues and Considerations,** the Region H consultants state that, "not all water users will reuse their wastewater, and the increased use of water due to overall growth will most likely offset the impact of reuse as a municipal irrigation water supply strategy. Therefore, the overall reduction in instream flows is not expected to be significant."

We find it very troubling that the consultants should depend on this type of reasoning when the RHWP is supposed to emphasize water conservation. This type of cavalier statement gives the erroneous impression that we can continue to use water profligately; that the increased water use due to overall growth is good and inevitable; and that any projected population increase is inevitable and somehow will come or be accommodated with increased water supply so that increased water use can occur. Is this the message and reality we want to leave our children, grandchildren, and great grandchildren?

Why is the RHWPG not requiring a stringent water conservation plan for golf courses, green space, and amenity lakes in the RHWP?

Why is the RHWPG not encouraging municipalities and other similar entities to either reduce water use at golf courses and amenity lakes or reduce the use or construction of these facilities in the RHWP?

Why is the RHWPG not addressing the important environmental impacts that will occur due to reuse of wastewater on golf courses, amenity lakes, and green spaces (additional pesticide and fertilizer use will also occur) in the RHWP?

Why is the RHWPG accepting that any and all projected population growth and economic growth is good and will be accommodated in the RHWP?

Appendix 4F Wastewater Reclamation for Municipal Irrigation

1) The same comments made above apply to this document.

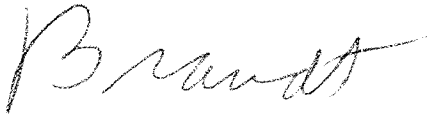
2) **On page 6, Potential Reuse Demands,** does the RHWPG really want to encourage groundwater use by creating credits for reuse when municipalities under-convert to surface water? Why not require a permanent reduction and not take the reduction and use it for more growth? Why not penalize a municipality that under-converts to surface water? The use of water credits simply will fuel more water use in the future and will ultimately create a bigger demand for water.

3) **On page 7, Percentage of Growth in MPC's,** it is of concern that MPC's create an increased water demand by emphasizing and encouraging the use of golf courses and amenity lakes. By agreeing to find water for these uses the RHWPG in the RHWP encourages more water use that could be saved and used for environmental purposes or other more necessary purposes. Not building golf courses, amenity lakes, and other unnecessary water uses should be encouraged in the RHWP versus encouraging unnecessary water uses.

The RHWPG must mandate a stringent water conservation plan for golf courses, green spaces, and amenity lakes to reduce overall water use and wastage in the RHWP.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,



Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, Texas 77096
713-664-5962
brandtshnfbt@juno.com

September 27, 2005

Mr. Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, TX 77096

Re: **Response to Comments on the Draft Wastewater Reclamation for Municipal Irrigation Water Management Strategy Analysis Technical Memorandum and Study of the 2006 Region H Regional Water Plan**

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input to the Draft Wastewater Reclamation for Municipal Irrigation Water Management Strategy Analysis Technical Memorandum and Study of the 2006 Regional Water Plan. The following letter provides responses to the comments you provided in your letter dated September 15, 2005.

Region H Water Management Strategy Analysis Technical Memorandum

*1) **On page 1, Introduction,** the question of whether the RHWP should encourage uses of water, like irrigating golf courses and amenity lakes, in the future is not presented or discussed. There is no discussion about how golf courses and amenity lakes can conserve water or reuse the water they do use.*

The HSC does not want to encourage water wasting activities. Watering green spaces, as long as not done wastefully, appears to be a more reasonable use because of the benefits that parks and green spaces provide for all citizens. Watering golf courses and amenity lakes are unnecessary water uses that should not be encouraged.

The watering of amenities, such as golf courses, lakes, and green spaces, will likely continue to occur and the Region H Water Planning Group does not have a mission or legal power to either encourage or discourage the watering of such amenities. Golf courses apply water which is absorbed into the ground to promote turf grass growth and amenity lakes use water to maintain lake levels, so the reuse of such water uses is not possible. However, we recommend reuse water to supply such demands in lieu of other water sources.

*2) **On page 4, Table 1, Projected Potential Demands for Reclaimed Wastewater,** for Brazoria County, in 2060, the percent of wastewater reuse demand for golf courses is 54.1%; for green spaces is 21.6%; and for amenity lakes is 24.3%.*

For Fort Bend County, in 2060, the percent of wastewater reuse demand for golf courses is 71.7%; for green spaces is 13.3%; and for amenity lakes is 15.1 %.

For Harris County, in 2060, the percent of wastewater reuse demand for golf courses is 50.8%; for green spaces is 23.1 %; and for amenity takes is 26.1 %.

For Montgomery County, in 2060, the percent of wastewater reuse demand for golf courses is 76.6%; for green spaces is 12.5%; and for amenity lakes is 10.9%.

This type of profligate use should not be tolerated or encouraged by the RHWPG. Of the total demand for 2060 of 30,631 acre feet/year of wastewater reuse demand, 21,131 acre feet or 69.0% is slated for golf course watering. If amenity lake use is included in this figure then you have 25,947 acre feet or 84.7% of the total wastewater reuse demand. This demand must come down especially since these are uses that are not necessary and do not benefit much of the public.

The amount of reuse water to be applied for municipal irrigation equates to approximately 11 percent of the expected county-other demand for these counties. The Region H Planning Group has no mission or legal authority to either encourage or discourage the types of developments to be constructed within the region.

*3) **On page 7, Issues and Considerations,** there is no discussion especially about how much the loss of this water from stream flows will impact ecosystems, wildlife, fish life, aquatic life, etc. The environmental impacts and costs need to be analyzed and displayed with the so-called benefits and calculations for how to achieve this amount of wastewater reuse.*

Much of these areas are currently on groundwater and therefore the reuse of wastewater should not affect the ecosystems because they should rely on natural surface water runoff. Only a portion of the wastewater treatment plant effluent is to be reused. As demands in the Region increase, the amount of wastewater return flows will be greater than the amount of reuse planned. Therefore, the expected return flows should at a minimum offset the loss of inflows due to the reuse.

*4) **On page 7, Issues and Considerations,** the Region H consultants state that, "not all water users will reuse their wastewater, and the increased use of water due to overall growth will most likely offset the impact of reuse as a municipal irrigation water supply strategy. Therefore, the overall reduction in instream flows is not expected to be significant."*

We find it very troubling that the consultants should depend on this type of reasoning when the RHWP is supposed to emphasize water conservation. This type of cavalier statement gives the erroneous impression that we can continue to use water profligately; that the increased water use due to overall growth is good and inevitable; and that any projected population increase is inevitable and somehow will come or be accommodated with increased water supply so that increased water use can occur. Is this the message and reality we want to leave our children, grandchildren, and great grandchildren?

Water conservation is already recommended as the first strategy in the Region H water plan. The reuse of effluent to meet a portion of the municipal demand further signifies the move towards increased water conservation. The Region H Planning Group has no legal authority to determine how and what type of developments will be constructed within the region, therefore they can only responsibly plan and recommend how the demand will be met with strategies, such as water conservation and reuse.

Why is the RHWPG not requiring a stringent water conservation plan for golf courses, green space, and amenity lakes in the RHWP?

Comment noted.

Why is the RHWPG not encouraging municipalities and other similar entities to either reduce water use at golf courses and amenity lakes or reduce the use or construction of these facilities in the RHWP?

The Region H Planning Group has no legal authority to determine how and what type of developments will be constructed within Region H.

Why is the RHWPG not addressing the important environmental impacts that will occur due to reuse of wastewater on golf courses, amenity lakes, and green spaces (additional pesticide and fertilizer use will also occur) in the RHWP?

Comment Noted.

Why is the RHWPG accepting that any and all projected population growth and economic growth is good and will be accommodated in the RHWP?

Comment Noted.

Appendix 4F Wastewater Reclamation for Municipal Irrigation

1) *The same comments made above apply to this document.*

See Responses to comments above.

2) ***On page 6, Potential Reuse Demands,*** *does the RHWPG really want to encourage groundwater use by creating credits for reuse when municipalities under-convert to surface water? Why not require a permanent reduction and not take the reduction and use it for more growth? Why not penalize a municipality that under-converts to surface water? The use of water credits simply will fuel more water use in the future and will ultimately create a bigger demand for water.*

The conversion credit system is regulated by the Harris-Galveston and Fort Bend Subsidence Districts and the RHWPG has no legal authority in their jurisdiction.

3) ***On page 7, Percentage of Growth in MPC's,*** *it is of concern that MPC's create an increased water demand by emphasizing and encouraging the use of golf courses and amenity lakes. By agreeing to find water for these uses the RHWPG in the RHWP encourages more water use that could be saved and used for environmental purposes or other more necessary purposes. Not building golf courses, amenity lakes, and other unnecessary water uses should be encouraged in the RHWP versus encouraging unnecessary water uses.*

The Region H Planning Group does not have the mission nor the legal authority to either encourage or discourage development trends within Region H.

The RHWPG must mandate a stringent water conservation plan for golf courses, green spaces, and amenity lakes to reduce overall water use and wastage in the RHWP.

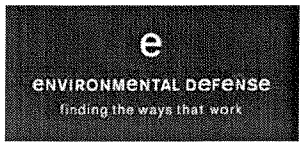
The RHWPG does not have the legal authority to mandate anything, including water conservation.

We appreciate your interest and comments.

Sincerely,

David Parkhill, P.E.
Project Principal

c: Region H Water Planning Group
Region H Consultant Team



September 16, 2005

Mr. Jim Adams, P.E.
General Manager
San Jacinto River Authority
P. O. Box 329
Conroe, TX 77305-0329

RE: Comments on the Initially Prepared 2006 Regional Water Plan for Region H

Dear Mr. Adams and Region H Water Planning Group Members:

The National Wildlife Federation, Lone Star Chapter of the Sierra Club, and Environmental Defense appreciate the opportunity to provide written comments on the Initially Prepared Regional Water Plan for Region H. We consider the development of comprehensive water plans to be a high priority for ensuring a healthy and prosperous future for Texas. We recognize and appreciate the contributions that you have made towards that goal. As you know, our organizations have provided, either individually or collectively, periodic input during the process of developing the plan. These written comments will build upon those previous comments in an effort to contribute to making the regional plan a better plan for all residents of Region H and for all Texans.

We do recognize that the draft Plan is subject to revision prior to adoption and is subject to continued revision in the future and provide these comments with such revisions in mind. Our organizations appreciate the amount of effort that has gone into developing the draft Plan for Region H. Your consideration of these comments will be appreciated.

I. BACKGROUND AND OVERVIEW

Our organizations support a comprehensive approach to water planning in which all implications of water use and development are considered. Senate Bills 1 and 2 (SB 1, SB 2), and the process they established, have the potential to produce a major, positive change in the way Texans approach water planning. In order to fully realize that potential, water plans must provide sufficient information to ensure that the likely impacts and costs of each potential water management strategy are described and considered. Only with that information can regional planning groups ensure compliance with the overarching requirement that "strategies shall be selected so that cost effective water management strategies which are consistent with long-term protection of the state's water resources, agricultural resources, and natural resources are adopted." 31 TAC § 357.7 (a)(9). Complying with this charge is essential in order to develop true plans that are likely to be implemented as opposed to a list of potential, but expensive and damaging, projects that likely will lead to more controversy than water supply. Comprehensive regional water plans have the potential to provide clear and effective guidance for development of water supplies within the region.

This document includes two types of comments. We consider the extent to which the initially prepared plan complies with the requirements established by SB1 and SB 2 and by the Texas Water Development Board (TWDB) rules adopted to implement those statutes. Key aspects of the initially prepared plan, including the failure in most instances to provide quantitative analysis of the environmental impacts of specific recommended water management strategies, do not meet explicit regulatory requirements that are prerequisites for plan approval. **In addition, our comments address important aspects of policy that might not be controlled by specific statutes or rules.** We do recognize that the financial resources available to the planning group are limited, which may restrict the ability of the group to fully address some issues as much as you would like. ***These comments are provided in the spirit of an ongoing dialogue intended to make the planning process as effective as possible.*** We strongly support the state's water planning process and we want the regional water plans and the state plan to be comprehensive templates that can be endorsed by all Texans.

The next section of the letter summarizes principles that inform our comments and how they relate to the initially prepared plan. The last section of the letter consists of specific comments keyed to different aspects of the initially prepared plan.

II. KEY PRINCIPLES

A. Maximize Water Efficiency

We strongly believe that improved efficiency in the use of water must be pursued to the maximum extent reasonable. New provisions included in SB 2 and TWDB rules since the first round of planning mandate strengthened consideration of water efficiency. Potentially damaging and expensive new supply sources simply should not be considered unless, and until, all reasonable efforts to improve efficiency have been exhausted. In fact, that approach is now mandated. Consistent with TWDB's rules for water planning, we consider water conservation measures that improve efficiency to be separate and distinct from reuse projects. We do agree that reuse projects merit consideration. However, the implications of those projects are significantly different than for water efficiency measures and must be evaluated separately.

The Texas Water Code, as amended by SB1 and SB 2, along with the TWDB guidelines, establishes stringent requirements for consideration and incorporation of water conservation and drought management. As you know, Section 16.053 (h)(7)(B), which was added after completion of the first round of regional planning, prohibits TWDB from approving any regional plan that does not include water conservation and drought management measures at least as stringent as those required pursuant to Sections 11.1271 and 11.1272 of the Water Code. In other words, the regional plan must incorporate at least the amount of water savings that are mandated by other law.

In addition, the Board's guidelines require the consideration of more stringent conservation and drought management measures for all other water user groups (WUGs) with water needs. Consistent with the TWDB rules, our comments treat water conservation and drought management as separate issues from reuse. Section 31 TAC § 357.7 (a)(7)(A) of the TWDB rules sets out detailed requirements for evaluation of water management strategies consisting of "water conservation practices." Section 357.7(a)(7)(B) addresses water management strategies

that consist of drought management measures. The separate evaluation of water management strategies that rely on reuse is mandated by 31 TAC § 357.7 (a)(7)(C).

We certainly acknowledge the progress made by Region H in incorporating water conservation into the initially prepared 2006 regional plan as compared to the 2001 version of the plan. However, much more progress is possible and needed. That is particularly true for the water user groups in Region H for which new interbasin transfers are recommended. TWDB rules are clear in requiring that a regional plan must, for each WUG for which a new interbasin transfer is recommended, include "a conservation water management strategy, pursuant to § 11.085 (l), that will result in the highest practicable level of water conservation and efficiency achievable." See 31 TAC § 357.7 (a)(7)(A)(iii) (emphasis added). ***The water conservation measures included in the initially prepared plan, although improved over the previous plan, simply do not meet applicable requirements and certainly do not achieve the levels of water savings needed to support the authorization of an interbasin transfer of water.***

B. Limit Nonessential Use During Drought

Drought management measures aimed at reducing demands during periods of unusually dry conditions are important components of good water management. As noted above, Senate Bill 2 and TWDB rules mandate consideration and inclusion in regional plans of reasonable levels of drought management as water management strategies. It just makes sense to limit some nonessential uses of water during times of serious shortage instead of spending vast sums of money to develop new supply sources simply to meet those nonessential demands. ***Because drought management measures are not included as water management strategies, the initially prepared plan does not comply with applicable requirements.***

C. Plan To Ensure Environmental Flows

Although critically important, designing and selecting new water management strategies that minimize adverse impacts on environmental flows is only one aspect of planning to meet environmental flow needs. New rules applicable to this round of planning require a quantitative analysis of environmental impacts of water management strategies in order to ensure a more careful consideration of those additional impacts. However, if existing water rights, when fully used, would cause serious disruption of environmental flows resulting in harm to natural resources, merely minimizing additional harm from new strategies would not produce a water plan that is consistent with long-term protection of natural resources or that would protect the economic activities that rely on those natural resources.

Accordingly, environmental flows should be recognized as a water demand and plans should seek to provide reasonable levels of environmental flows. Environmental flows provide critical economic and ecological services that must be maintained to ensure consistency with long-term protection of water resources and natural resources. ***We recognize and applaud the RHWPG for its identification and incorporation of target environmental inflows for Galveston Bay into the draft Region H plan. We also acknowledge the efforts of the Region H planning consultants to provide a quantitative assessment of the overall impact of all Region H/Region C water management strategies on those target inflows. There are other environmental impacts than***

just those associated with target inflows, of course, including, as an example, the location of inflows within a bay system.

However, the inititially prepared Region H plan does not provide, with perhaps one exception, quantitative analyses of environmental impacts of the specific proposed water management strategies. Nor do we believe that the initially prepared plan demonstrates consistency with long-term protection of natural resources or agricultural resources. The plan recommends water management strategies that would result in the destruction of bottomland hardwoods, wetlands, and other important wildlife habitat and fails to consider the potential implications on oyster beds and productivity in the Galveston Bay system that would result from changes in location and volume of freshwater inflows into that system. Moreover the level of impact analysis done to determine consistency of the plan with protection of natural and agricultural resources is too limited to allow any consistency determination.

D. Minimize New Reservoirs

Because of the associated adverse impacts, new reservoirs should be considered only after existing sources of water, including water efficiency and reuse, are utilized to the maximum extent reasonable. When new reservoirs are considered, adverse impacts to regional economies and natural resources around the reservoir site must be minimized. Regardless of whether the proposed reservoir is located inside or outside the boundaries of the region, reservoir development must be shown to be consistent with long-term protection of the state's water, agricultural, and natural resources. We recognize that the draft 2006 Region H plan eliminates two on-channel reservoirs, Little River and Bedias Reservoirs, that were recommended water management strategies in the 2001 plan, and we commend the RHWPG for taking that step. However, we note that both the on-channel Little River Reservoir and the Bedias Reservoir are listed in the draft 2006 plan as "alternative water management strategies" in case recommended strategies are not or cannot be pursued. Because other sources, including existing reservoirs, would be less damaging and less costly, we do not believe that the on-channel Little River and the Bedias Reservoirs should be included even as alternative water management strategies.

E. Manage Groundwater Sustainably

Wherever possible, groundwater resources should be managed on a sustainable basis. Mining groundwater supplies will, in many instances, adversely affect surface water resources and constitute a tremendous disservice to future generations of Texans. Generally speaking, depleting groundwater sources will not be consistent with long-term protection of the state's water resources, natural resources, or agricultural resources. ***We commend the Region's commitment to sustainable groundwater yield.***

F. Facilitate Short-Term Transfers

SB 1 directs consideration of voluntary and emergency transfers of water as a key mechanism for meeting water demands. Water Code Section 16.051 (d) directs that rules governing the development of the state water plan shall give specific consideration to "principles that result in the voluntary redistribution of water resources." Similarly, Section 16.053 (e)(5)(H) directs that regional water plans must include consideration of "voluntary transfers of water within the

region using, but not limited to, regional water banks, sales, leases, options, subordination agreements, and financing arrangements...." Thus, ***there is a clear legislative directive that the regional planning process must include strong consideration of mechanisms for facilitating voluntary transfers of existing water rights within the region, particularly on a short-term basis as a way to meet drought demands.***

In addition, emergency transfers are intended as a way to address serious water shortages for municipal purposes. They are a way to address short-term problems without the expense and natural resource damage associated with development of new water supplies. Water Code Section 16.053 (e)(5)(I), as added by SB 1, specifically directs that emergency transfers of water, pursuant to Section 11.139 of the Water Code, are to be considered, including by providing information on the portion of each non-municipal water right that could be transferred without causing undue damage to the holder of the water right. Thus, the water planning process is intended as a mechanism to facilitate voluntary transfers, particularly as a means to address drought situations, by collecting specific information on rights that might be transferred on such a basis and by encouraging a dialogue between willing sellers and buyers on that approach.

We commend Region H for beginning to address this issue in the discussion of non-municipal water contract transfers in Appendix 4B8, something which most regional groups appear not to have done. We believe, however, that more extensive transfers should be contemplated than just the ones that are recommended in the draft Plan, and emergency transfer opportunities should be expressly examined.

III. PAGE-SPECIFIC COMMENTS

For ease of tracking, we have attempted to identify our individual, page-specific comments by preceding each with a number enclosed in brackets.

EXECUTIVE SUMMARY

E.5.3 – Socioeconomic Impact of Not Addressing Shortages

[#1] We disagree with the following assumption made by the Texas Water Development Board (TWDB) in calculating the potential impacts of not meeting projected water demands: "No technological advances or changes in human behavior occur (i.e., water use patterns remain as they are today)." This is an incredible assumption to be made for a planning process that stretches to the year 2060 – certainly there will be technological advances over the next 50+ years that will affect water use. Moreover, studies indicate that changes in water use patterns by humans occur, for example, after people experience water use reductions during drought and learn that they can get by with less water.

[#2] TWDB's socioeconomic impact analysis does not provide a balanced view. A complete socioeconomic analysis would look at the total "costs" of implementing water management strategies intended to provide water for certain water user groups – including the costs of lost bay and estuary productivity, the loss of wetlands habitat that may provide protection for coastal property in violent storms, the financing costs to taxpayers, etc. TWDB only looks at potential

loss of jobs and income if a drought occurs, but it does not compare that to the loss of jobs and economic value from pursuing certain strategies to address water "shortages."

CHAPTER 1 – DESCRIPTION OF THE REGION

1.7.1 – Water Management Strategies Recommended in the 2001 Regional Plan

[#3] As of September 2005 only a few of the nine additional water management strategies approved by the Region H Water Planning Group in 2004 as amendments to the 2001 Plan have been approved by the Texas Water Development Board. Thus most of these strategies are not part of the approved 2001 Plan and should not be identified as such.

[#4] In addition this draft Plan should state candidly that the nine additional water management strategies, if all approved by the Board and officially incorporated into the 2001 Plan, along with the previous water management strategies in the approved 2001 Plan, together would supply vastly more water for the region by 2050 than would be needed to meet the projected "unmet" water demands in the 2001 Plan.

1.7.2 – Unique Stream Segments Recommended in the 2001 Regional Plan

[#5] Under S.B. 1 the Texas Legislature is authorized to designate "unique stream segments" upon recommendation by a regional planning group. Language should be inserted into this section to clarify that it is the Legislature that makes this decision. Moreover, the language in this section regarding the six "unique stream segments" should be modified (in keeping with the section heading and the table heading) to reflect that six streams were "recommended for designation as Streams of Unique Ecological Value in Region H" rather than "designated as Streams of Unique Ecological Value in Region H." The Legislature has not yet made any such designations, and that fact should be noted in this section. A comment to this effect in made later in Chapter 1 (1.8) with regard to legislative recommendations from the 2002 State Water Plan, but making a similar comment here would make clear the status of these stream segments.

1.7.3 – Unique Reservoir Sites Recommended in the 2001 Regional Plan

[#6] Similar to the comment immediately above, language should be added to this section to clarify that it is the Legislature that decides whether or not to designate a location as a "unique reservoir site." Moreover, the language in this section should be modified to indicate that "The RHWPG has recommended for designation the site locations of each of these projects [Allens Creek, Bedias, and Little River] as unique sites" rather than "The RHWPG has decided to designate the site locations...as unique sites." As noted later in Chapter 1 (1.8) only Allens Creek has been designated by the Legislature as a "unique site," and that fact should be noted in this section as well.

1.7.4 – Regulatory and Administrative Recommendations from the 2001 Plan

[#7] We differ with the RHWPG on the advisability of some of the regulatory and administrative recommendations from the 2001 Plan; but since this section merely describes the recommendations that were made in the earlier plan, we do not offer any comments here on

those recommendations. Comments are provided later in this document regarding the regulatory and administrative recommendations made in this updated version of the plan.

CHAPTER 2 – PRESENTATION OF POPULATION AND WATER DEMANDS

2.1.2 – Background

[#8] The sentence "Currently, estimates of Texas population anticipate the water demand will nearly double, increasing from 21 million (current population) to 45 million people by the year 2060" is erroneous or at least poorly stated. The relationship between population growth and water demand is not a 1:1 ratio. The 2002 State Water Plan estimated that the population of the state would double from the year 2000 to the year 2050 but that the total projected demand for water in that period would only increase 18%.

2.3.1 – Regional Summary of Projections by Category

[#9] Irrigation Water Demand – The very large differences between the TWDB draft irrigation demand estimates and the irrigation water demand estimates proposed by Region H – representing as noted a 36.17 percent increase over the TWDB projections for the year 2060 – deserve much more explanation here (and/or a reference to where else in the 2006 Plan the explanation for the difference is provided). How is the general public to evaluate the rationale behind this large difference in volume without being provided the assumptions that go into the proposed demand figures? The "Agricultural Irrigation Water Demand Basis for Revision" acceptable to TWDB is laid out in 2.2.3.3, but there is no explanation here of whether and how the Region H revisions of the agricultural irrigation water demand meet those criteria.

[#10] Steam-Electric Power Generation Water Demand – Something appears to be amiss in one of these two sentences: "Region H adopted the TWDB default steam-electric power generation water demands projections. The default TWDB projections were also adopted by TWDB." Do the TWDB default projections adopted by Region H incorporate the impact of enacted and expected energy efficiency requirements, such as the federal energy efficiency standards for clothes washers that take effect in 2007 and will dramatically lower energy use by clothes washers over the next half-century?

[#11] Mining Water Demand – In Chapter 1 of this draft plan (on page 1-12) appears the following statement: "Mining water demands in Region H are associated primarily with oil and gas production." This section of Chapter 2 says that "The proposed mining water demand by decade for Region H [the TWDB default projections] is 49,473 AFY in the year 2000 and 69,457 AFY in 2060. When comparing the 2001 and 2006 RWP mining water demand estimates for the region, there is a 46 percent and 97 percent mining water demand increase in the 2006 RWP for the 2000 and 2050 decades, respectively." Does Region H believe that water demands associated primarily with oil and gas production are going to ***increase*** over the next 50 years?

CHAPTER 3 – ANALYSIS OF CURRENT WATER SUPPLIES

3.1 – Introduction

[#12] Although there is discussion in this chapter about how attempts to address land subsidence in some parts of the region are necessarily reducing the volume of groundwater pumped and thus necessitating more dependence on surface water supplies, there appears to be no discussion about any other physical relationship between surface water and groundwater. Is there no hydraulic connection between groundwater sources and surface water sources in any part of Region H that bears at least some discussion and consideration?

3.2.3 – Aquifer Conditions

[#13] Much (valuable) discussion is provided in this section regarding groundwater sources and the ability to pump "substantial quantities of good quality water to help satisfy the multiple water needs of the region," but there is no discussion about recharge to the aquifers, any potential contamination threats (and means of preventing contamination), and any possible impacts on volume of recharge by different activities.

3.3.5 – Legal and Regulatory Constraints

[#14] The subheading refers to them as legal and regulatory "constraints." The language in this section refers to them more appropriately as legal and regulatory "factors." These factors have many positive aspects for water management and should not be portrayed primarily as constraints on water development. Consider, for example, the statement on page 3-36 that "Current limitations on interbasin transfers will affect the development of future water resource management strategies." This statement is probably intended to reflect the perspective that the "junior water rights" provision in SB 1 reduces the prospect for any new interbasin transfers. By the same token, however, the requirement for new interbasin transfers that an applicant for such a transfer demonstrate "the highest practicable levels of water conservation and efficiency achievable" should help to spur water conservation and efficiency efforts that will allow a region to stretch existing water supplies further before having to seek new ones.

3.3.6 – Environmental Uses and Requirements

[#15] **3.3.6.1 – Bay and Estuary Inflows** – We again acknowledge and commend Region H for incorporating into the 2001 Plan and the 2006 draft plan the recommendation of the Galveston Bay Freshwater Inflows Group (GBFIG) for target freshwater inflows into the Bay. Although the comprehensive environmental water needs for Galveston Bay are subject to refinement in the coming years, the GBFIG recommendation represents an important placeholder that highlights the importance of meeting these needs as well as the needs of other WUGs in the region.

3.3.8 – Recreational Uses

[#16] Although this section mentions a number of water-based or water-related recreational uses in Region H, much of this discussion focuses on reservoir-related recreational use and does not give a similar level of attention to certain other water-based or water-related recreational uses such as the bayous, creeks, river segments, marshes, and other areas in Region H that are suitable for and increasingly popular for canoeing and/or kayaking. These types of water-based recreational opportunities are heavily dependent upon maintenance of instream flows and thus serve as a reminder of the importance of environmental flows for economic as well as ecological

purposes. More information on this type of recreation, including examples of recreational areas dependent upon the maintenance of environmental flows and the natural environment should be provided in this section.

3.4 – Total Water Supply

[#17] 3.4.1 – Water Supplies Available by City and Category – Supply Allocation – We are confused by the following sentences: "However, as the increase in mining demand over the planning periods increased significantly, it was assumed that local supplies could only be used to meet remaining shortages after groundwater and surface water allocation only for the 2000 planning period. This year 2000 local supply quantity was then assumed to be available through the year 2060." What does the first sentence mean, especially in relationship to the second one?

CHAPTER 4 – IDENTIFICATION, EVALUATION AND SELECTION OF WATER MANAGEMENT STRATEGIES BASED ON NEEDS

4.2 – Potential Water Management Strategies

[#18] 4.2.3 – Need for Interbasin Transfers – We acknowledge the importance of existing interbasin transfers to meeting the water demands of the region. With regard to any future interbasin transfers of water in or into the region, as stated above, the Texas Water Code requires that any applicant for such a transfer will have to demonstrate that the entity has achieved "the highest practicable levels of water conservation and efficiency achievable." Meeting future water demands in the region through new interbasin transfers should not be assumed unless the regional plan also assumes (and the relevant entities actually achieve) "the highest practicable levels of water conservation and efficiency achievable."

[#19] 4.2.4 – Drought Management – This section acknowledges that "Regional Water Planning Guidelines require that drought management strategies be considered for each identified need" and that "If drought management is not selected as a strategy, the reason must be documented." ***The discussion in this session totally fails, however, to provide an adequate rationale for the decision not to select drought management as a water management strategy to meet any identified water "need."***

The draft Region H Plan states in this section that:

> "Under non-drought conditions, the region will have a surplus of water supply due to full or near-full yield of surface water rights and decreased demand for irrigation supply. The shortages identified in the plan are based on future demands (based on projected growth) exceeding the drought yield of existing supplies. The strategies recommended to meet these shortages also reflect estimated drought yields. Because Region H was able to address all projected shortages through conservation, allocation of existing supplies and ***development of new supplies*** [emphasis added], no unmet demands remain to be addressed through drought management strategies."

Region H planners have chosen development of new supplies over a drought management strategy that would reduce water demands to correspond with the drought yield of existing

supplies (when coupled with ongoing water conservation and efficiency efforts). Then the authors of the draft Plan – in a highly circular argument – attempt to use this *fait accompli* as the justification for this very action. In effect they are saying "We don't have to adopt drought management as a strategy because we have already decided not to adopt it as a strategy (!)."

[#20] At the very least the RHWPG could adopt drought management as a water management strategy and preclude the need for ***some*** of the strategies that entail development of new supplies, thereby avoiding their economic and ecological costs. In fact, the TWDB rules, and Section 16.053 (h)(7)(B) of the Water Code, **require** that the plan **include** as water management strategies at least the levels of drought management otherwise required by Section 11.1272 of the Water Code. *See* 31 TAC § 357.7 (a)(7)(B).

[#21] Region H planners acknowledge the existence of drought contingency plans by municipalities and water providers throughout the region but then proceed to downplay the significance of these plans and fail to incorporate them into the regional plan other than to outline them in an appendix. If Region H planners do not feel that current drought contingency plans are sufficient to address long-term droughts, then they should make recommendations on how to strengthen these plans to meet such situations rather than dismiss out-of-hand the possibility of drought management as a key water management strategy.

4.3 – Strategy Evaluation and Selection

[#22] We support the assumption made by the RHWPG "that every municipal WUG with a projected shortage would utilize conservation before seeking out or increasing a WWP contract."

[#23] 4.3.1 – Evaluation of Water Management Strategies – We appreciate the effort by the Region H planners to compare the potential water management strategies using a screening table and to rate the various strategies using evaluation criteria. We also appreciate the candid statement that "Certain strategies (i.e., the inter-basin transfer of supply from east Texas and all of the potential reservoir sites) were rated negatively due to the significant habitat and flows impacts these projects entail."

[#24] 4.3.3 – Alternative Water Management Strategies – We have serious concerns about the identification of alternative water management strategies in the Region H plan because we fear that these alternative strategies become a "backdoor" means of incorporating into the plan water management strategies that are perhaps more controversial than the recommended strategies. A regional water plan needs to make choices and set out a clear path that water use groups can follow in order to meet the region's water demands.

[#25] There is a process for amending a regional water plan between planning cycles, and those planning cycles themselves represent opportunities to revamp water management strategies on a periodic basis to reflect changing circumstances. Appropriate use of the amendment process and the planning updates represent a much preferable approach to replacing or augmenting recommended water strategies than simply enumerating "alternative" strategies without providing a full analysis of each of those strategies that would allow the public to make fully informed comment. Although we believe that alternative strategies legally may be substituted for recommended strategies only through a formal plan amendment, we believe the plan itself

should make clear that "alternative strategies" really are just potentially feasible strategies that should receive first consideration if additional supply is needed.

4.4 – Strategy Allocation

[#26] While we would probably differ with the characterization of the City of Houston's water conservation program as "aggressive," we appreciate and applaud the City of Houston for asking that its water conservation program be reflected in the Region H plan as a water management strategy even though it is not projected to experience a shortage within the planning period.

4.5 – Impacts of the 2001 State Water Plan on Galveston Bay Inflows

[#27] 4.5.5.4 – Summary of Results – Region C water management strategies should not be assumed as a given in modeling the likelihood of meeting freshwater inflow targets for Galveston Bay. The 2001 Region C plan included some strategies, especially the highly controversial proposed Marvin Nichols reservoir that would be located in the Sulphur River Basin, that are not likely to be implemented, thus making the estimates of the freshwater inflow impacts of "large amounts of imported water producing return flows in the upper Trinity Basin" highly unrealistic. In addition, it is worth noting that the current version of the initially prepared plan for Region C includes very large-scale wastewater reuse projects, which only further illustrates the tenuous nature of large-scale increases in return flows from the upper basin.

Appendix 4B1 – Water Management Strategies – Municipal Conservation

[#28] In the summer of 2003 the Sierra Club provided RHWPG with a paper discussing improvements in municipal water use efficiency anticipated to occur as a result of the implementation of new laws already enacted or other factors such as behavioral changes occurring over time as part of responses to drought. One of the specific examples offered by the Sierra Club at that time was **implementation of new federal energy efficiency standards for clothes washers – set to go into effect in 2007** – that are widely anticipated to have the residual impact of improving water use efficiency (one way to reduce the energy needed to heat water for certain wash cycles is to reduce the volume of water that needs to be heated, for example).

As new clothes washers are purchased over the coming decades to replace old, less water efficient ones, there will be a decline in per unit water use in this category. Region H should reflect this fact either in lower municipal demands for water over the 50-year planning period than would be the case in the absence of the clothes washer standards or in the adoption of the implementation of these standards as a water management strategy (or part of the municipal conservation strategy) that will result in quantifiable water use savings.

There was an indication two years ago that the RHWPG would seriously consider the latter approach, but **we see no evidence in the draft Region H plan that the implementation of the clothes washer standards has been factored into either municipal water demands for Region H or into the municipal water conservation strategy for the Region. The Region C draft plan, by contrast, factors into its municipal water conservation strategy the water use savings anticipated to result from compliance with the federal clothes washer standards. We urge the RHWPG to address this issue.** Otherwise the water use savings that are going to

occur as a natural consequence of implementing these standards are not going to be captured in the Region H plan.

[#29] We appreciate the recommendation by the RHWPG that all of the municipal conservation best management practices (BMPs) identified in the TWDB Report No. 32 (a report prepared by the state Water Conservation Implementation Task Force) be utilized within Region H for those WUGs with shortages to meet conservation goals.

[#30] However, **we believe that an estimate of the water savings from the implementation of all these BMPs rather than just those BMPs identified in the City of Houston's water conservation plan should be provided as part of the Region H plan.** Otherwise we do not have a complete picture of the potential for conservation to meet "unmet" water needs in the region. Conceivably, these additional savings from conservation might take care of projected shortages for additional WUGs and certainly would reduce the unmet needs of other WUGs.

[#31] It is instructive to note that the survey of Region H municipal WUGs as to whether they currently use and/or would consider in the future the 21 potential water conservation strategies indicates that only ***three*** of those strategies actually are ***used*** by a majority of the 60 out of 165 WUGs that responded. Furthermore, only ***five*** of the 21 potential strategies are either used and/or would be considered by a majority of those 60 WUGs. While it is impossible to know what the other 105 municipal WUGs are doing and/or considering doing regarding water conservation, it is not unreasonable to assume that many of the WUGs did not respond to the survey because they are not doing anything regarding water conservation. Therefore, the potential benefits of RHWPG pushing municipal water conservation as a major management strategy appear to be great.

[#32] Indeed what appears to be the projected overall savings from implementation of municipal water conservation measures recommended by RHWPG – 7 percent of total (municipal) water use by the year 2005 and sustained at an annual level of approximately 7 percent thereafter – is not a particularly aggressive goal (we acknowledge that the impacts of implementation of the plumbing fixtures standards are not reflected in this figure).

[#33] We believe that as part of an effort to achieve more than a 7 percent projected overall savings the Region H water planners should recommend that municipal WUGs adopt the municipal water conservation targets for retail public water utilities recommended by the state Water Conservation Task Force – the one percent reduction annually in per capita water use based on a five-year rolling average for those utilities with water use of more than 140 GPCD (gallons per capita per day). The Region L water planners have taken this approach, for example.

[#34] We are troubled by the lack of information in the Region H plan about per capita water use, which is a concept that the average person finds easier to understand and evaluate than acre-feet per year. It would be especially helpful in looking at the net effects of implementation of water conservation measures over the planning period – seeing how anticipated per capita water use changes for each WUG over a period of 50 years.

Appendix 4B2 – Potential Reservoir Sites

[#35] We realize that this appendix is simply a laundry list of all the potential reservoir sites in the Region. We note, however, that with a couple of exceptions, the potential reservoirs for which any environmental examination has been made indicate high or moderate to high environmental impacts – telegraphing that any focus of attention on new reservoirs as water management strategies is fraught with controversy and negative consequences.

Appendix 4B3 – Irrigation Conservation

[#36] Generally we find the discussion in this section to be valuable and a reasonable assessment of the potential for irrigation conservation. We would make three observations, however: First, although mention is made that irrigation conservation could free up water for other uses within certain areas, it does not appear to be translated into any specific water management strategy for meeting any other WUG's unmet water demands. We believe that this should be an actual recommended management strategy for certain WUGs with shortages.

[#37] Second, the potential for irrigation conservation might be enhanced if some of the water could be made available to other WUGs with shortages as a result of those WUGs being willing to pay for the implementation of the irrigation conservation practices that would free that water for other uses. In other words there may be more financial incentive opportunities than obtainable simply through the sale of conserved water – ones that would be a catalyst for taking action to implement irrigation conservation practices. While we are not necessarily advocating that all water saved through irrigation conservation be made available for other uses, that certainly would be preferable to some of the other more environmentally questionable water management strategies that might be pursued.

[#38] Third, although we understand the argument made regarding Fort Bend County irrigation use of groundwater – that any irrigation groundwater conserved there is not going to be available for other uses and thus the financial incentive for implementing conservation is not as great – we believe that it is always prudent to promote conservation. There may be funding sources, such as federal farm program monies, that could be obtained for achieving conservation of that water, which would be beneficial for the area aquifer even if the conserved water would not be made directly available for other uses.

Appendix 4B4 – Municipal Wastewater Reclamation for Manufacturing Use

[#39] While municipal wastewater reclamation for manufacturing use is an idea worthy of examination and has many potential benefits, we are concerned about the lack of quantitative analysis of the environment impacts of this strategy. Indeed this is a generic problem with the draft Region H plan – the failure to do quantitative analysis of the environmental impacts of individual water management strategies.

Appendix 4B5 – City of Houston/Trinity River Authority Contract Agreement

[#40] Other things being equal, the use of existing water supplies is certainly preferable to developing new ones, and the potential use of uncommitted water from Lake Livingston is

worthy of further examination. We are troubled, however, by some of the potential environmental impacts of the possible strategy, including the anticipated decrease in freshwater inflows into the upper Trinity Bay estuary. Redirection of flow in the Galveston Bay system (through the San Jacinto River) does not necessarily provide the same benefits as the flows into the Trinity Bay portion of the system. Again we note the absence of detailed quantitative analysis of the environmental impacts of this strategy.

[#41] We are also confused by language that seems to indicate on one hand that the Luce Bayou Transfer is critical to implementation of this strategy and on the other hand that there are workable alternative conveyance systems, including existing ones. Also, this discussion talks about a potential 200,000 AF/Y that might be made available through agreement between the City and TRA, but elsewhere in the draft Region H plan the figure of 150,000 AF/Y is used. We assume that the 200,000 was the initial figure for purposes of the technical memorandum and that the 150,000 is the subsequent recommendation, but clarification would be helpful.

Appendix 4B6 – Luce Bayou Transfer Project

[#42] There appear to be significant environmental impacts associated with the possible construction and operation of the Luce Bayou Transfer Project based on the narrative discussion of these impacts (in the absence of the required quantitative analysis of environmental impacts). At a minimum full consideration and examination should be made of the alternative of a pipeline from Lake Livingston to convey presently uncommitted water if the final decision is to pursue uncommitted water from the lake as a water management strategy – although there are environmental considerations associated with that diversion of water as well.

Appendix 4B7 – Houston to Gulf Coast Water Authority Transfer

[#43] We again raise concerns about changes in inflow patterns into the Galveston Bay system, although a full evaluation of the extent of those concerns is problematic due to the lack of a quantitative analysis of environmental impacts.

Appendix 4B8 – Non-Municipal Contract Transfers

[#44] We support the pursuit of non-municipal contract transfers as a water management strategy. As stated in the technical memorandum: "Contractual transfers make the most efficient use of existing water supplies by allocating available supplies to entities needing the water." We do acknowledge a potential environmental impact in terms of the diversion of some previously unused water supplies, such as the possible reduction in instream flows in the Brazos and San Bernard from possible transfers (especially since the mouth of the San Bernard is in danger of closing), and these need to be evaluated more closely – underscoring once again the need for quantitative analysis. This strategy, however, seems worthy of more examination.

Appendix 4B9 – Bedias Reservoir-SJRA Interbasin Transfer

[#45] We oppose the construction of the Bedias Reservoir due to the unacceptable environmental impacts associated with the project, and we commend the RHWPG for dropping the Bedias Reservoir as a recommended water management strategy. However, we oppose the

recommendation that it be designated as a unique reservoir site, and we also oppose its inclusion in the list of possible alternative water management strategies.

Appendix 4B10 – City of Houston Wastewater Reclamation for M/I Use

[#46] We certainly agree with the serious examination of water reuse as a legitimate water management strategy, but it is extremely important that all environmental impacts of water reuse, especially that of large water reuse projects, be thoroughly considered. "Environmental impacts, impacts to other water rights, and other issues or concerns will be addressed during the permitting process" fails to meet the requirement for quantitative analysis of environmental impacts as well as being a failure of the planning process to provide a meaningful overall examination of this water management strategy. This is a serious omission in the draft Region H plan, especially considering the volume of water contemplated in this recommended strategy.

Appendix 4B11 – NHCRWA Wastewater Reclamation (Indirect Wastewater Reuse)

[#47] This strategy is so preliminary that it is difficult to make any comment or reach any conclusion about it. However, we reiterate our concern about the statement that "Environmental impacts, impacts to other water rights, and other issues or concerns will be addressed during the permitting process." This does not constitute the quantitative analysis of environmental impacts required by the planning process.

Appendix 4B12 – New San Jacinto River Water Rights

[#48] Again there is no quantitative analysis of environmental impacts as required by the planning process. Among other issues, the impacts of changing locations of inflows into the Galveston Bay system must be considered.

Appendix 4B13 – Little River Reservoir

[#49] We again note our opposition to the construction (and unique reservoir site designation) of the on-channel Little River Reservoir. We acknowledge the fact the this on-channel reservoir is not a recommended water management strategy in the draft 2006 Region H water plan, but we object to its inclusion as a possible alternative water management strategy.

Appendix 4B14 – Industrial Conservation

[#50] The technical memorandum correctly states the difficulties in trying to project savings from industrial water conservation activities because of the diversity in industrial processes and water uses. We disagree, however, with the conclusion that because it may not be possible to predict these savings with pinpoint accuracy the 2006 Region H draft plan should not attempt to incorporate ***any*** projected water savings from industrial conservation over the next 50 years.

[#51] As the cost of water likely increases over the next half century and the technology of water efficiency improves, manufacturing companies and other industrial concerns will certainly seek to reduce their use of water in order to improve their bottom line – even to the point of seeing a movement toward closed-loop systems for water use. The RHWPG should at a

minimum adopt a generic, conservative figure for water savings from industrial conservation over the planning horizon – at least in the range of 10% or more over the 50-year period – and adjust that figure as experience dictates in subsequent planning rounds. To do otherwise will overestimate manufacturing water use in the coming decades and lead to the pursuit of other unnecessary water management strategies. The likely progress in industrial water conservation should also have a beneficial result in increasing prospects for more contractual transfers.

Appendix 4B16 – Brazos River Authority System Operations

[#52] Although we do not take a position at this time regarding the BRA system operations proposal as a water management strategy for Region H, we appreciate the effort to provide at least some quantitative analysis of environmental impacts of this strategy.

Appendix 4B17 – Expanded Use of Groundwater

[#53] We appreciate the fact that this water management strategy is discussed in the context of staying within the limits of sustainable groundwater yield.

Appendix 4B18 – Freeport Seawater Desalination

[#54] Continued examination of seawater desalination as a water management strategy for meeting the needs of coastal municipalities and industry is warranted. Care must be taken to have a thorough evaluation, however, of the energy and environmental issues, as well as other issues, related to such projects. The draft Region H plan is woefully lacking in discussing, much less providing a quantitative analysis of, the environmental impacts of the wastewater discharge associated with a project such as the Freeport Seawater Desalination Project.

Appendix 4B21 – TRA to SJRA Contract Via Lake Houston

[#55] We raise similar issues here to those raised in conjunction with the possible City of Houston/TRA Contract Agreement (Appendix 4B5).

Appendix 4B23 – Little River Off-Channel Reservoir

[#56] Although an off-channel reservoir is preferable to an on-channel reservoir from an environmental perspective, we do not support the Little River off-channel reservoir as a recommended water management strategy for the 2006 Region H draft plan. The minimal narrative comments about possible environmental impacts of the project and the lack of any quantitative analysis of those impacts make it impossible to evaluate the project at this time.

CHAPTER 5 – IMPACTS OF WATER MANAGEMENT STRATEGIES ON KEY PARAMETERS OF WATER QUALITY AND IMPACTS OF MOVING WATER FROM RURAL AND AGRICULTURAL AREAS

5.2 – Impacts of Water Management Strategies on Key Parameters of Water Quality

[#57] In general the discussion of the impacts of the recommended water management strategies on key parameters of water quality is informative although we disagree with some of the assertions made (for example, the contention that building the two recommended reservoirs would benefit water quality). The discussion is narrative and general in nature, however, and needs more clarity about the anticipated level of impacts on specific water quality parameters.

[#58] We recommend more specific attention, for example, to a consideration of the effects on dissolved oxygen from the implementation of some of the water management strategies since it is an important indicator of impacts to aquatic life and, as such, an important determinant of the effect of water management strategies on the state's natural resources.

5.4 – Impacts of Moving Water from Rural and Agricultural Areas

[#59] The discussion in this section appears to downplay the significance in Region H of transfers of water from rural and agricultural areas, but we believe there is clearly an important shift of water from rural and agricultural areas to urban and suburban areas over the 50-year planning period and that this shift deserves more attention from the regional water planners. One item that is not discussed in this section is how any shift will affect wildlife resources in rural areas where hunting, fishing, and wildlife viewing are becoming increasingly important economic activities supporting rural landowners.

CHAPTER 6 – WATER CONSERVATION AND DROUGHT MANAGEMENT PLANS

[#60] This chapter is primarily an enumeration of the statutory and administrative rule requirements governing the preparation of water conservation and drought contingency plans in Texas (which are required of various water rights holders, water suppliers, and recipients of state funding for water projects) as well as a presentation of templates for water conservation plans and drought contingency plans.

[#61] The templates are of value and logically constructed. They do not, however, constitute the "model" water conservation plans and drought contingency plans that had been anticipated based on the Water Development Board's outline of sections of a regional water plan for this second round of planning. We appreciate the potential complexity of trying to provide even a model municipal water conservation plan for retail water suppliers that may vary widely in size of population served and other factors. However, the effort to promote and facilitate municipal water conservation, for example, would be enhanced by actual ***model*** conservation plans that would incorporate the most effective best management practices, reflect the lessons learned by municipal suppliers implementing conservation programs, and go beyond being an outline.

CHAPTER 7 – LONG-TERM PROTECTION OF THE STATE'S WATER RESOURCES, AGRICULTURAL RESOURCES, AND NATURAL RESOURCES

[#62] We commend the RHWPG for taking the position that groundwater should be used up to the "local sustainable yield, or …the more restrictive limit established under subsidence district regulations, to meet local demands," but that groundwater should not be exported from its county of origin." This approach lessens the potential impacts of groundwater use on water resources, agricultural resources, and natural resources.

7.1 – Water Resources within Region H

[#63] We are concerned that several water management strategies recommended in the draft Region H plan would have the effect of moving the inflow locations for a significant volume of the freshwater inflows into the Galveston Bay system – primarily a shift of environmental flows from the Trinity Basin to the San Jacinto Basin – which would have an impact on oyster beds, for example. A quantitative analysis of this type of change impacting the Bay is required by 31 TAC § 357.7(a)(8)(A)(ii) and (B).

7.2 – Agricultural Resources within Region H

[#64] The discussion of the impact of the draft Region H plan on agricultural resources is exceptionally brief. We believe that a more substantial examination of the impacts of the plan is required.

7.3 – Natural Resources within Region H [mis-numbered in the draft plan as 7.1]

[#65] 7.3.1 – Threatened and Endangered Species [mis-numbered as 7.1.1] – As noted in Chapter 4 in the discussion of the water management strategy known as the Luce Bayou Transfer, there is a serious impact of this project on bottomland hardwood and other natural ecosystems providing habitat for a diversity of wildlife. Even the off-channel Little River Reservoir project might inundate habitat for the Houston Toad and Interior Least Tern and require mitigation. Allens Creek Reservoir also has the potential to impact wetlands habitat. Given the dramatic demonstration recently of the significance of coastal wetlands, the potential impact of these projects on such wetlands and related habitats requires more extensive evaluation.

[#66] 7.3.3 – Impacts of Water Management Strategies on Unique Stream Segments [mis-numbered as 7.1.3] – More information should be provided about the concern that overuse of groundwater would impact springflows within Sam Houston National Forest.

[#67] 7.3.4 – Impacts of Water Management Strategies on Galveston Bay [mis-numbered as 7.1.4] – We again reiterate our concerns about relying on water management strategies (increased wastewater flows) from Region C to assure maintenance of inflows to Galveston Bay and about changes in inflow patterns resulting from the implementation of certain Region H water management strategies.

CHAPTER 8 – ECOLOGICALLY UNIQUE STREAM SEGMENTS, UNIQUE RESERVOIR SITES, AND LEGISLATIVE RECOMMENDATIONS

8.1 – Unique Stream Segments

[#68] We support the recommendation that the following six stream segments in Region H be designated as "unique stream segments:" Armand Bayou, Austin Bayou, Bastrop Bayou, Big Creek (Fort Bend), Big Creek (San Jacinto), Cedar Lake Creek, Menard Creek, and Oyster Bayou.

8.2 – Unique Reservoir Sites

[#69] We oppose the recommendation that the sites for Little River Off-Channel Reservoir, Bedias Reservoir, and Little Reservoir be designated as unique reservoir sites. Among other concerns, there is no clear definition of each reservoir site, there is no discussion of whether and to what extent such a designation impacts the property value or resale of property within the designated area would be, and there is no real need for any of these reservoir projects.

8.4 – Regulatory, Administrative, and Legislative Recommendations

[#70] It is not practical to comment on each of these recommendations. Four that we would highlight:

- We support the recommendation that the Legislature adopt the recommended stakeholder process for determining bay and basin environmental flow requirements, and include Region H and the Galveston Bay Freshwater Inflows Group (GBFIG) in the Galveston Bay stakeholder group.
- We oppose the recommendation to "maintain the current rule of capture basis of groundwater law within Texas in all areas not subject to defined groundwater conservation districts."
- We support the recommendation to "implement the programs recommended by the Water Conservation Implementation Task Force."
- We are concerned about the recommendations for more "flexibility" in the use of alternative water management strategies and "modification" of notice requirements for regional plan amendments ("the devil is in the details").

CHAPTER 9 – INFRASTRUCTURE FINANCING [not included in the IPP]

CHAPTER 10 – PUBLIC INVOLVEMENT IN DEVELOPING THE 2006 REGION H WATER PLAN

[#71] We appreciate the extensive documentation of public participation provided by the Region H water planners in this chapter. We also appreciate the openness that the RHWPG has shown to our organizations in allowing us the opportunity to make presentations to the RHWPG at its meetings, to distribute our materials on water topics at its meetings, to announce our regional and state water conferences at its meetings, and to provide us with written materials upon request. In addition, we appreciate the change that was made in the format of the RHWPG meetings to provide the opportunity for public comment at more opportune times during the meetings rather than at the end of the meetings. Finally, we appreciate the opportunity that was provided by the RHWPG to have the Region H planning consultants make a presentation on the draft 2006 plan to a special public meeting co-hosted by Galveston Bay Foundation and the Sierra Club in August of this year.

[#72] We are concerned, however, about the relatively low level of public participation at the meetings of the RHWPG and the public hearings held by the planning group – outside of consultants, government officials, and professional advocates. The August 11 public meeting

co-hosted by GBF and Sierra Club in cooperation with the RHWPG was an outstanding exception to the rule about lack of public turnout at Region H events.

[#73] We are also concerned about the difficulty in obtaining materials prior to the RHWPG meetings that relate to agenda items at the meetings – hampering the ability to provide meaningful and helpful public input to the planning group members at the meetings. We understand that even RHWPG members have had trouble getting materials for the meeting far enough in advance (if at all) to be able to review those materials and be prepared to act on the issues to which those materials relate.

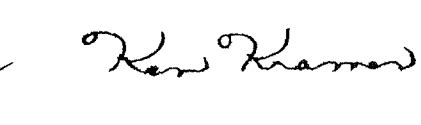
[#74] We would strongly urge the RHWPG to take steps to enhance the ability of the public to have the information to participate effectively in the regional planning process and to facilitate their ability to attend meetings and keep up-to-speed with the planning process. To that end we would recommend that the RHWPG do the following:

- Establish a separate website for Region H to which planning materials, meeting notices, and other such items could be posted electronically in advance of meetings and hearings (Regions C, G, and L are examples of regions that have such websites);
- Consider holding RHWPG meetings at a more easily accessible location than the San Jacinto River Authority offices (although we appreciate Chairman Adams' hospitality at that location).
- Consider holding at least some of the RHWPG meetings in the evening to allow more people who work during the day to attend a meeting and monitor the process.

Our organizations certainly stand ready and willing to help the RHWPG in enhancing public participation in the regional planning process.

Thank you again for the opportunity to submit these comments.

Sincerely,



Myron Hess
National Wildlife Federation

Mary Kelly
Environmental Defense

Ken Kramer
Sierra Club, Lone Star Chapter

October 31, 2005

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Subject: Response to Comments on the Initially Prepared 2006 Regional Water Plan for Region H.

Dear Mr. Hess, Ms. Kelly and Mr. Kramer:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input provided in your letter dated September 16, 2005, on the Initially Prepared 2006 Region H Water Plan (IPP). The following letter provides responses from the Consultant Team to your comments and has been approved by the Region H RWPG.

Section I, Background, and Section II, Key Principles

Sections I and II contain general statements. Those topics requiring responses are addressed in the page- specific comments below.

Section III, Page-Specific Comments

1-2) Section E.5.3, Socioeconomic Impacts of Not Addressing Shortages. The authors disagree with the TWDB assumption that "no technological advances or changes in human behavior will occur" and point out that the analysis does not look at the "costs" of implementing water management strategies.

The RHWPG agrees that the modeling assumption seems limited, but points out that the TWDB applied this model to every region, with highly varied climates, industries and water use patterns. Developing unique models for each region, with reasonable assumptions for future use patterns, was likely beyond the time and budget available to the TWDB staff. Please note that this analysis is included in the plan for comparative purposes only, and did not factor into the water management strategy selection process. Also, the Planning Rules in 31TAC357 only require an economic analysis of not meeting needs. The additional analysis you request would be useful, but was not included in the scope of work for the 2006 Plan.

3-4) Section 1.7.1, Water Management Strategies Recommended in the 2001 Regional Plan. Those strategies added under Amendment 1 should be labeled as such, and those that have not been approved by the TWDB should be identified as such. The Plan should state candidly that "the nine additional water management strategies, if all approved by the Board and officially incorporated into the 2001 Plan, along with the previous water management strategies in the approved 2001 Plan, together would supply vastly more water for the region by 2050 than would be needed to meet the projected "unmet" water demands in the 2001 Plan."

The report will be updated to identify those strategies recommended under Amendment 1, and the status of Board actions concerning the Amendments.

5) Section 1.7.2, Unique Streams. Please clarify that the Region recommended six streams as unique, but only the Legislature can designate a stream as unique. To date, they have not designated any unique streams.

The wording will be corrected per your suggestion.

6) Section 1.7.3, Unique Reservoir Sites. Please clarify that the Region recommended three sites as unique, but only the Legislature can designate a unique reservoir site. To date, only Allens Creek has been designated as unique.

The wording will be corrected per your suggestion.

7) Section 1.7.4, The authors disagree with some of the regulatory and administrative recommendations from the 2001 Plan, but do not offer comments here.

Thank you for recognizing this section as a summary of the previous plan.

8) Section 2.1.2, The sentence "Currently, estimates of Texas population anticipate the water demand will nearly double, increasing from 21 million (current population) to 45 million people by the year 2060" is erroneous or at least poorly stated. The relationship between population growth and water demand is not a 1:1 ratio. The 2002 State Water Plan estimated that the population of the state would double from the year 2000 to the year 2050 but that the total projected demand for water in that period would only increase 18%.

The text will be corrected to read that "population will nearly double". You are correct in noting that the overall water demand will not double, because over half the current water use in the state is for irrigation, which is projected to decline throughout the planning period.

9) Section 2.3.1, Irrigation water demands in the plan differ from the TWDB draft irrigation demand estimates. A better explanation of the rationale for using these higher estimates is needed in the text.

The Region H draft agricultural irrigation demands recommended by the consultant team represent a combined effort by the team and David Jenkins (RHWPG member), as well as the Texas A&M University Rice Extension Service, various county agents, and other groups.

The process outlined in the Exhibit B guidance prepared by the Texas Water Development Board allows the RHWPG to accept the draft Year 2000 demands as representative of the base demand from which future demands will be projected, or to select any year during the period 1995 to 1999 as a more representative base year. The data from Year 2000, as well as all of the data for the 1995 to 1999 period, were obtained from the TWDB's Water Use Survey database.

Agricultural irrigation water demand is subject not only to the unpredictability of the weather and the available supply of irrigation water; but also to the price fluctuations of the individual crops irrigated. For this reason, demand may be low in a single year because of low price for a certain commodity. Prices are affected by supply and demand, as well as by government policies. This is why the use of a year during the period from 1995 to 1999, that best reflects the average of those years, is preferred for those counties where the TWDB's Year 2000 demand estimate appears to be inadequate. The total demands

recommended by the Region H Consultant Team start approximately 7 percent below the levels in the approved 2002 plan and decrease from there at the same rate of decrease utilized in the 2002 plan.

10) Section 2.3.1, Steam-electric power: Something appears to be amiss in one of these two sentences: "Region H adopted the TWDB default steam-electric power generation water demands projections. The default TWDB projections were also adopted by TWDB." Do the TWDB default projections adopted by Region H incorporate the impact of enacted and expected energy efficiency requirements, such as the federal energy efficiency standards for clothes washers that take effect in 2007 and will dramatically lower energy use by clothes washers over the next half-century?

The sentence, "The default TWDB projections were also adopted by TWDB", will be deleted. The adopted TWDB default estimates of steam-electric power demands were developed by a consultant to the TWDB and it is unknown whether the federal energy efficiency standards for clothes washers and their impacts on energy are incorporated into their estimates.

11) Section 2.3.1 In Chapter 1 of this draft plan (on page 1-12) appears the following statement: "Mining water demands in Region H are associated primarily with oil and gas production." This section of Chapter 2 says that "The proposed mining water demand by decade for Region H [the TWDB default projections] is 49,473 AFY in the year 2000 and 69,457 AFY in 2060. When comparing the 2001 and 2006 RWP mining water demand estimates for the region, there is a 46 percent and 97 percent mining water demand increase in the 2006 RWP for the 2000 and 2050 decades, respectively." Does Region H believe that water demands associated primarily with oil and gas production are going to increase over the next 50 years?

The wording in this section will be clarified. Some of the demands reported as Manufacturing in the 2001 plan have been reported as Mining in this plan. That revision increased the projected growth in Mining, with a corresponding decrease in the Manufacturing demand.

12) Section 3.1, Although there is discussion in this chapter about how attempts to address land subsidence in some parts of the region are necessarily reducing the volume of groundwater pumped and thus necessitating more dependence on surface water supplies, there appears to be no discussion about any other physical relationship between surface water and groundwater. Is there no hydraulic connection between groundwater sources and surface water sources in any part of Region H that bears at least some discussion and consideration?

Yes, there is hydraulic connection between surface water and groundwater sources in various parts of Region H and these connections have been discussed and considered in this section of the report. Part of the discussion is on Page 3-6 regarding the major and minor aquifers being principally recharged via infiltration of precipitation and stream flow on their outcrops. There also is discussion that a limited amount of the precipitation that infiltrates soil, reaches the zone of saturation of the aquifer and moves downdip through the aquifers. There is a large amount of precipitation on the outcrops that is rejected recharge and becomes runoff. There also is a certain amount of precipitation that infiltrates in the outcrop areas, and where the outcrop areas are incised by intermittent or perennial streams, the water discharges from the outcrop areas via evapotranspiration or is discharged to streams. Along some streams or rivers that have in the past deposited substantial amounts of permeable alluvial sediments in their flood plains, stream flow can provide part of the replenishment of water to the river alluvium.

13) Section 3.2.3, Much (valuable) discussion is provided in this section regarding groundwater sources and the ability to pump "substantial quantities of good quality water to help satisfy the multiple water needs of the region," but there is no discussion about recharge to the aquifers, any potential

contamination threats (and means of preventing contamination), and any possible impacts on volume of recharge by different activities.

There is discussion regarding recharge to the aquifers in a previous Section 3.2.1. A vast majority of the recharge areas for the aquifers occur where there is minimal urban or industrial development. There are efforts during oil and gas well drilling to set and cement casings to depths that protect the fresh water aquifers. In urbanized areas, environmental regulations administered by the TCEQ help minimize the potential for aquifer contamination. The recharge areas for the aquifers are principally located outside the major urban and industrial areas along the Gulf Coast as shown on Figure 3.3, thus reducing their susceptibility to potential contamination threats that might exist in those areas.

14) Section 3.3.5, the subheading refers to them as legal and regulatory "constraints." The language in this section refers to them more appropriately as legal and regulatory "factors."

The header will be changed per your recommendation.

15) Section 3.3.6.1, We again acknowledge and commend Region H for incorporating into the 2001 Plan and the 2006 draft plan the recommendation of the Galveston Bay Freshwater Inflows Group (GBFIG) for target freshwater inflows into the Bay.

Thank you for your continued cooperation and support in protecting this resource.

16) Section 3.3.8, Although this section mentions a number of water-based or water-related recreational uses in Region H, much of this discussion focuses on reservoir-related recreational use and does not give a similar level of attention to certain other water-based or water-related recreational uses such as the bayous, creeks, river segments, marshes, and other areas in Region H that are suitable for and increasingly popular for canoeing and/or kayaking. These types of water-based recreational opportunities are heavily dependent upon maintenance of instream flows and thus serve as a reminder of the importance of environmental flows for economic as well as ecological purposes. More information on this type of recreation, including examples of recreational areas dependent upon the maintenance of environmental flows and the natural environment should be provided in this section.

We concur in your recognition of the increasing importance of this region's waterways for various types of water-based recreation and do not intend to suggest that these uses are less desirable than reservoir-based activities. Appendix 3F further outlines potential recreational activities within the Region. However, the RHWPG was not funded to conduct specific research into the minimum flows required to support various types of water-based recreation. The study activities that were conducted for this section were in accordance with a scope of work and budget established at the outset of the planning process and presented and reviewed within the regional planning meetings.

17) Section 3.4.1, We are confused by the following sentences: "However, as the increase in mining demand over the planning periods increased significantly, it was assumed that local supplies could only be used to meet remaining shortages after groundwater and surface water allocation only for the 2000 planning period. This year 2000 local supply quantity was then assumed to be available through the year 2060." What does the first sentence mean, especially in relationship to the second one?

The text will be changed to read, "However, it was assumed that these supplies would not increase in quantity over the planning period and alternative sources would be required to supplement any growth in demand. The year 2000 local supply quantity was held constant through the year 2060."

18) Section 4.2.3, Need for interbasin transfers. The authors question whether the plan requires "the highest practicable levels of water conservation and efficiency achievable" prior to recommending future interbasin transfers to meet projected needs.

Water conservation is the initial strategy recommended for every water user group with a projected shortage. The conservation savings projected in the plan are conservative, based on a strict interpretation of the phrase "highest practicable levels ... achievable." In response to your later comment #28, clothes washer efficiency savings will be added to the plan.

Please note that the two water management strategies that involved new inter-basin transfers of supply (Sabine Basin to Region H Interbasin Transfer and Bedias Creek Reservoir to Montgomery County Transfer) were considered but not recommended. The interbasin transfers in the 2006 Plan reflect full use of existing contracts and currently permitted transfers.

19, 20, 21) Section 4.2.4, Drought Management. The authors express disappointment that drought management is not recommended as a water management strategy. They point out that the Region has a surplus of supply under non-drought conditions, and that many of the water user groups have existing drought contingency plans.

The text in Section 4.2.4 will be clarified to better summarize the spatial relationships of supply and demand in the region. While Region H has an overall surplus of supply, that surplus does not coexist with the growing demand areas. The majority of available supply is in Lake Livingston, which is in the Trinity Basin. The majority of the growth is occurring in Brazoria, Fort Bend, Harris and Montgomery Counties, which are in the Brazos and San Jacinto Basins. To meet the demands where they occur, the plan reflects transferring supply from the Trinity into the San Jacinto Basin. Once that infrastructure is constructed, it is not "drought-susceptible", because the permitted yield of the underlying water rights does not exceed the drought yield. Similarly, surface supplies are replacing groundwater due to subsidence regulations, and that supply is also firm yield.

Within the Brazos Basin, there is a significant difference between the permitted and drought yield of the DOW manufacturing water right (almost 60,000 acre-foot/year, or 30% of the permitted yield). Other lower basin water rights also see drought affects, although none so severe. The TCEQ requires that supplies used to meet municipal demands be firm (drought-of-record) yields, so none of this non-reliable supply may be assigned to meet future growth. It is generally more costly to transfer existing supply from the Trinity Basin than to develop new supply in-basin; therefore, the new in-basin projects with firm yields were recommended in the plan as being superior to inter-basin transfers.

Finally, while you correctly point out that many water users have published drought contingency plans, it should also be noted that none of them include estimates of water savings to be achieved by these plans. Also, the measures in these plans (limits on landscape watering and car washing, for example), are temporary and cannot be expected to last throughout a five-year drought, which is what this plan must address. Reducing water demand through long-term conservation programs remains the most viable planning tool, while drought management as a water demand strategy is most appropriately considered as a "buffer" or safety factor between estimated and actual drought conditions which might be more severe than predicted.

22) Section 4.3.1, the authors support the assumption made by the RHWPG "that every municipal WUG with a projected shortage would utilize conservation before seeking out or increasing a WWP contract."

The RHWPG appreciates your support.

23) Section 4.3.1, the authors appreciate the effort by the Region H planners to compare the potential water management strategies using a screening table and to rate the various strategies using evaluation criteria.

The RHWPG appreciates your support.

24, 25) Section 4.3.3, The authors have serious concerns about the identification of alternative water management strategies in the Region H plan because they fear that these alternative strategies become a "backdoor" means of incorporating into the plan water management strategies that are perhaps more controversial than the recommended strategies. ... Although we believe that alternative strategies legally may be substituted for recommended strategies only through a formal plan amendment, we believe the plan itself should make clear that "alternative strategies" really are just ***potentially feasible strategies that should receive first consideration if additional supply is needed.*** *(emphasis added)*

Your concern about alternate strategies by-passing a portion of the screening process is noted. The suggested clarification (presented in bold-type above) will be added to the section.

26) Section 4.4, the authors appreciate and applaud the City of Houston for asking that its water conservation program be reflected in the Region H plan as a water management strategy even though it is not projected to experience a shortage within the planning period.

The RHWPG appreciates your support.

27) Section 4.5.5.4, the Region C water management strategies should not be assumed as a given in modeling the likelihood of meeting freshwater inflow targets for Galveston Bay. Some of the listed strategies may not be implemented.

The WAM model used for that analysis was developed in 2002-03, based on the strategies in the 2002 State Water Plan and in accordance with the approved scope of work for the Region H Plan. We agree that the model should be updated in the future after approval of the Region C management strategies to reflect these subsequent plans in order to continue the process of further evaluating future inflows into Galveston Bay. We understand that the Texas Water Development Board is currently working on this activity and that results should be available for review sometime next year..

28-34) Appendix 4B1, Municipal Water Conservation. The authors ask if the water savings from energy-efficient clothes washers are reflected in the conservation estimates. They appreciate the plan citing all of the best management practices (BMP) in the TWDB Report 32, and believe the savings from all of these BMP's should be included in the water management strategy (thus increasing the savings from the current 7%). The authors recommend the municipal water conservation targets for retail public water utilities recommended by the state Water Conservation Task Force – the one percent reduction annually in per capita water use based on a five-year rolling average for those utilities with water use of more than 140 GPCD (gallons per capita per day). Finally, the authors ask that conservation data be presented in per capita values, in addition to annual acre-feet.

The conservation savings from energy-efficient clothes washers were overlooked in the IPP, but will be added in the final plan. Please note that even with 100% market penetration, the savings will not off-set the need for other water management strategies.

The collection of BMPs used in the municipal water conservation strategy were conservatively based upon those currently in-use within the region. While additional conservation may be achievable from energy-efficient appliances, at present no enforcement mechanism exists to ensure that any significantly aggressive goals can be considered achievable.

All supply and demand data is presented in the plan in acre-feet, to be consistent with the TWDB planning guidelines. We concur that it is sometimes confusing to the reader.

35) Appendix 4B2, the authors realize that this appendix is simply a laundry list of all the potential reservoir sites in the Region. They note, however, that with a couple of exceptions, the potential reservoirs for which any environmental examination has been made indicate high or moderate to high environmental impacts – telegraphing that any focus of attention on new reservoirs as water management strategies is fraught with controversy and negative consequences.

The RHWPG appreciates your comment.

36-38) Appendix 4B3, the authors make three observations: First, although mention is made that irrigation conservation could free up water for other uses within certain areas, it does not appear to be translated into any specific water management strategy for meeting any other WUG's unmet water demands. Second, the potential for irrigation conservation might be enhanced if some of the water could be made available to other WUGs with shortages as a result of those WUGs being willing to pay for the implementation of the irrigation conservation practices that would free that water for other uses. Third, although we understand the argument made regarding Fort Bend County irrigation use of groundwater – that any irrigation groundwater conserved there is not going to be available for other uses and thus the financial incentive for implementing conservation is not as great – we believe that it is always prudent to promote conservation.

The Plan does reflect the use of conserved irrigation supply to meet other needs in Waller County. You are correct in pointing out that the municipal WUGs could subsidize the capital efforts required to achieve this conservation and contract to use the resulting available supplies. In fact, recommendations to formalize this procedure are made in Chapter 8. The RHWPG concurs with your position of promoting water conservation whenever possible, which is why they directed the Consultant Team to add Fort Bend County to the list of recommended counties.

39) Appendix 4B4, while municipal wastewater reclamation for manufacturing use is an idea worthy of examination and has many potential benefits, we are concerned about the lack of quantitative analysis of the environment impacts of this strategy.

In response to this and several similar comments we have received, a brief analysis of projected return flows and reuse volumes will be added to Chapter 7. Please note that in this estimate, 90% of current Harris County return flows remain in-stream. Also note that the standard deviation in Harris County bayou flows (variation due to weather changes) is greater than the total wastewater return flow to the bayous.

40-41) Appendix 4B5, City of Houston / Trinity River Authority Contract. The authors state that the use of existing supplies is preferable to developing new ones, but express concern about potential impacts to Trinity Bay. They also ask about the necessity of the Luce Bayou Transfer, and the difference between the 200,000 ac-ft/yr shown in the technical memorandum and the 150,000 ac-ft/yr shown in the plan tables.

The RHWPG appreciates your concern about Trinity Bay. The Luce Bayou Transfer will be needed to convey the TRA supply to Harris County. The City of Houston has the capacity to convey their full water right via the Coastal Water Authority main canal, but the new conveyance is needed to carry the TRA supply. Additionally, the Luce Bayou Transfer moves supply into Lake Houston, which is near the point of need, rather than to the Houston Ship Channel. The strategy was considered as 200,000 ac-ft/yr being purchased by the City of Houston. A portion of that supply is also needed for Montgomery County, which is expected to be served by the San Jacinto River Authority. Therefore, in the plan tables, we allocated the strategy by the receiving wholesale provider (150,000 to Houston and 50,000 to SJRA).

42) Appendix 4B6, there appear to be significant environmental impacts associated with the possible construction and operation of the Luce Bayou Transfer Project based on the narrative discussion of these impacts (in the absence of the required quantitative analysis of environmental impacts). At a minimum full consideration and examination should be made of the alternative of a pipeline from Lake Livingston to convey presently uncommitted water if the final decision is to pursue uncommitted water from the lake as a water management strategy – although there are environmental considerations associated with that diversion of water as well.

The RHWPG appreciates your concern, and points out that the conveyance as described reflects the current water right provisions. Please note that the Coastal Water Authority is initiating the environmental permitting studies for this project, which is likely to include evaluation of appropriate alternatives, and the RHWPG will reflect their study results in subsequent plans.

43) Appendix 4B7, Houston to Gulf Coast Water Authority Transfer. The authors express concern about changes to inflow patterns to Galveston Bay.

The RHWPG appreciates your concern.

44) Appendix 4B8, the authors support the pursuit of non-municipal contractual transfers, but point out that there are potential impacts of diverting some previously unused water supplies.

Your comments are noted.

45) Appendix 4B9, the authors oppose the construction of the Bedias Reservoir due to the unacceptable environmental impacts associated with the project, and they commend the RHWPG for dropping the Bedias Reservoir as a recommended water management strategy. However, they oppose the recommendation that it be designated as a unique reservoir site, and oppose its inclusion in the list of possible alternative water management strategies.

Your comments are noted.

46) Appendix 4B10, City of Houston Wastewater Reuse. The authors certainly agree with the serious examination of water reuse as a legitimate water management strategy, but it is extremely important that all environmental impacts of water reuse, especially that of large water reuse projects, be thoroughly considered. "Environmental impacts, impacts to other water rights, and other issues or concerns will be addressed during the permitting process" fails to meet the requirement for quantitative analysis of environmental impacts as well as being a failure of the planning process to provide a meaningful overall examination of this water management strategy.

The water management strategy assessments were limited by the information available for the various strategies. For example, several of the water rights applications did not specify the size and location of

the pump station(s) required to divert the requested water. Without knowing the diversion locations, the consultant team could not delineate between the reach of the river or stream above the diversion point, which would be unaffected, and the reach below the diversion point, which would experience decreased flows. Also, without knowing the location of the required pump station, the team could not determine the current land use at the site, and assess whether impacts to habitat would occur.

Given this limitation, the team had several options in completing the evaluation. The most conservative option would be to assume that the entire proposed facility would impact wetlands and habitats. The most generous option would be to assume that the entire facility could be sited to avoid all wetlands and habitats. The third option is to acknowledge that impacts may occur, depending upon the site selected, but they cannot be quantified without additional data. That was the option selected for all of the entries you cite in your comment letter.

47) Appendix 4B11, NHCRWA Wastewater Reclamation (Indirect Wastewater Reuse). This strategy is so preliminary that it is difficult to make any comment or reach any conclusion about it. However, we reiterate our concern about the statement that "Environmental impacts, impacts to other water rights, and other issues or concerns will be addressed during the permitting process." This does not constitute the quantitative analysis of environmental impacts required by the planning process.

See response to comment 46.

48) Appendix 4B12, New San Jacinto River Water Rights. Again there is no quantitative analysis of environmental impacts as required by the planning process. Among other issues, the impacts of changing locations of inflows into the Galveston Bay system must be considered.

This strategy uses San Jacinto River supply in the San Jacinto Basin, reducing the potential need to transfer water from the Trinity Basin. It is one of the few strategies that do not change the location of return flows to Galveston Bay. We will consider adding a map to this tech memo to clarify this point.

49) Appendix 4B13, the authors again note our opposition to the construction (and unique reservoir site designation) of the on-channel Little River Reservoir. They acknowledge the fact the this on-channel reservoir is not a recommended water management strategy in the draft 2006 Region H water plan, but object to its inclusion as a possible alternative water management strategy.

Your opposition is noted.

50-51) Appendix 4B14, Industrial Conservation. The authors disagree with the decision to include the management strategy without some estimate of water savings. They advocate the adoption of a generic, conservative figure for water savings of at least 10% or more over the 50-year period.

TWDB Report 32 states that Industrial Water Audits can yield 10 to 35 percent savings, and assume that this is the primary source of your recommendation. However, the majority of industries in Region H converted from inexpensive groundwater to more costly surface water within the last 20-years, and likely conducted self-audits at that transition in order to address operating costs. Unfortunately, there is currently a lack of information to justify that the net savings will equal 10% of demand and it would be risky to make such an assumption without any basis to support it.

52) Appendix 4B16, BRA System operations. The authors do not take a position at this time regarding the BRA System Operations proposal as a water management strategy for Region H, but they appreciate the effort to provide at least some quantitative analysis of environmental impacts of this strategy

Your comments are noted.

53) Appendix 4B17, Expanded Use of Groundwater. The authors appreciate the fact that this water management strategy is discussed in the context of staying within the limits of sustainable groundwater yield.

The RHWPG appreciates your support.

54) Appendix 4B18, Freeport Seawater Desalination. Continued examination of seawater desalination as a water management strategy for meeting the needs of coastal municipalities and industry is warranted. Care must be taken to have a thorough evaluation, however, of the energy and environmental issues, as well as other issues, related to such projects. The draft Region H plan is woefully lacking in discussing, much less providing a quantitative analysis of, the environmental impacts of the wastewater discharge associated with a project such as the Freeport Seawater Desalination Project.

As you stated above, continued examination of seawater desalination as a water management strategy for meeting needs of coastal municipalities and industry is warranted, but the strategy and environmental impacts are based on studies conducted to date. No additional funds were granted the Region H WPG to explore in detail all environmental impacts associated with this water management strategy. However, as stated in the text, the impacts are expected to be reduced due to the existing discharge canal and limited estuary around the proposed facilities.

55) Appendix 4B21, TRA to SJRA Contract Via Lake Houston. The authors raise similar issues here to those raised in conjunction with the possible City of Houston/TRA Contract Agreement (Appendix 4B5).

Your concern is noted. See response to 40) and 41).

56) Appendix 4B23, Little River Off-Channel Reservoir. Although an off-channel reservoir is preferable to an on-channel reservoir from an environmental perspective, the authors do not support the Little River off-channel reservoir as a recommended water management strategy for the 2006 Region H draft plan. The minimal narrative comments about possible environmental impacts of the project and the lack of any quantitative analysis of those impacts make it impossible to evaluate the project at this time.

Your concern is noted.

57-58) Section 5.2, Impacts of Water Management Strategies on Key Parameters of Water Quality. In general the discussion of the impacts of the recommended water management strategies on key parameters of water quality is informative, although we disagree with some of the assertions made (for example, the contention that building the two recommended reservoirs would benefit water quality). The discussion is narrative and general in nature, however, and needs more clarity about the anticipated level of impacts on specific water quality parameters. We recommend more specific attention, for example, to a consideration of the effects on dissolved oxygen from the implementation of some of the water management strategies since it is an important indicator of impacts to aquatic life and, as such, an important determinant of the effect of water management strategies on the state's natural resources.

We understand your comments on this section to be general in nature but to explicitly request more clarity and specificity regarding important stream water quality parameters. While this additional detail may be feasible for some individual water management strategies and for some specific water quality

parameters, there is generally insufficient information at this stage of planning to provide meaningful details such as dissolved oxygen modeling, nutrient loading analysis, or conservative constituent mass balance calculations for the water management strategies included in this plan. We believe that the qualitative discussion and analysis provided in Section 5.2 is more appropriate and useful to understanding the potential impacts of the strategies at this stage of the planning process. Any detailed quantitative analysis of water quality impacts of the strategies at this stage would be necessarily general in nature and the results would be of limited value. As individual projects are developed in more detail in the future and specific environmental permits are considered by the project sponsors, more detailed water quality analyses should appropriately be conducted at that time.59) Section 5.4, Impacts of Moving Water from Rural and Agricultural Areas. The discussion in this section appears to downplay the significance in Region H of transfers of water from rural and agricultural areas, but we believe there is clearly an important shift of water from rural and agricultural areas to urban and suburban areas over the 50-year planning period and that this shift deserves more attention from the regional water planners. One item that is not discussed in this section is how any shift will affect wildlife resources in rural areas where hunting, fishing, and wildlife viewing are becoming increasingly important economic activities supporting rural landowners.

The Region H RWPG is sensitive to the general trend of moving water supplies from rural areas into urban and suburban areas. The specific water demands of the Houston area's dense urban population and large industrial complex could easily impact the surrounding rural areas; however, that impact to-date has not occurred nor is it expected to occur as a result of the strategies within this IPP. First, all projected livestock and agricultural demands within the rural areas of Region H are met during the planning period and there is no management strategy which has been considered in detail which would reduce needed supplies for these rural and agricultural areas. In fact, the management strategies proposed within this IPP actually increase the available supplies in the rural areas of the region in a number of important ways. As a result of the local river authority sponsorships, two existing large reservoirs in Region H, Livingston and Conroe, have provisions to reserve water for the surrounding areas' needs even though they were built primarily to meet the water needs of Houston. In addition, two new off-channel reservoirs, Allens Creek and Little River Off-Channel Reservoirs, are proposed in rural locations but will allow the diversion of stream flow during high flow periods and store that flow for later releases downstream during periods of need. There are no projects proposed to remove water from these rural areas which would otherwise have been available to those local areas.. New water rights proposed on the San Jacinto River divert water from Lake Houston, after the national forest and upland areas enjoy the same run-off and stream flows they always have had. In summary, there is no "shift" or transfer of water which will negatively affect rural and agricultural areas.

Another concern sometimes expressed in this context is that suburban growth is encroaching into rural and agricultural land surrounding Houston, particularly in Brazoria, Fort Bend, and Montgomery Counties. This fundamental change in land use is accelerating and is likely to have a much more significant impact on the rural areas, including the wildlife resources and other traditional activities of these areas, than the potential small changes to stream flow frequencies or water quality that might occur as a result of the related water resources development. Analysis of that change in land use and its impacts to these rural areas is outside the scope of the water planning efforts of this group.

60-61) Chapter 6, Water Conservation and Drought Management Plans. This chapter is primarily an enumeration of the statutory and administrative rule requirements governing the preparation of water conservation and drought contingency plans in Texas (which are required of various water rights holders, water suppliers, and recipients of state funding for water projects) as well as a presentation of templates for water conservation plans and drought contingency plans. The templates are of value and logically constructed. They do not, however, constitute the "model" water conservation plans and

drought contingency plans that had been anticipated based on the Water Development Board's outline of sections of a regional water plan for this second round of planning. We appreciate the potential complexity of trying to provide even a model municipal water conservation plan for retail water suppliers that may vary widely in size of population served and other factors. However, the effort to promote and facilitate municipal water conservation, for example, would be enhanced by actual model conservation plans that would incorporate the most effective best management practices, reflect the lessons learned by municipal suppliers implementing conservation programs, and go beyond being an outline.

The information provided in Chapter 6 reflects the Region H Consultant Team's interpretation of the Water Development Board's requirements for Chapter 6 for this second round of planning. Your suggestions for additional guidance regarding best management practices and lessons learned related to municipal conservation programs are valid needs but beyond the scope of this regional planning activity.

62) Chapter 7, the authors commend the RHWPG for taking the position that groundwater should be used up to the "local sustainable yield, or ...the more restrictive limit established under subsidence district regulations, to meet local demands," but that groundwater should not be exported from its county of origin." This approach lessens the potential impacts of groundwater use on water resources, agricultural resources, and natural resources.

The RHWPG appreciates your support.

63) Section 7.1, Water Resources within Region H. The authors are concerned that several water management strategies recommended in the draft Region H plan would have the effect of moving the inflow locations for a significant volume of the freshwater inflows into the Galveston Bay system – primarily a shift of environmental flows from the Trinity Basin to the San Jacinto Basin – which would have an impact on oyster beds, for example. A quantitative analysis of this type of change impacting the Bay is required.

The RHWPG endorsed the Galveston Bay Freshwater Inflows Group frequency target for freshwater inflows. In the scope of work for the 2006 Region H Water Plan, the modeling of projected inflows and evaluation against these targets was funded, but detailed studies of species-specific impacts were not. Currently, there is no guidance provided by the resource agencies (TCEQ, TWDB, or TPWD) related to the target flows which are appropriate for the various regions of the Galveston Bay system; therefore, no quantitative analysis can be made of the impacts. The freshwater inflow analysis done under this regional plan does include definition of the changes that you reference, just not the impacts.

64) Section 7.2, the discussion of the impact of the draft Region H plan on agricultural resources is exceptionally brief. We believe that a more substantial examination of the impacts of the plan is required.

Agricultural water users (for irrigation and livestock) continue to obtain water from their existing sources within this plan, so no significant impact is anticipated. Historical changes within the agricultural industry in this area (which are significant) are clearly being driven by factors other than availability and cost of water supplies. The water conservation and new contracts recommended in the plan address the difference between full- and drought-yields of irrigation water rights.

65) Section 7.3.1, Threatened and Endangered Species. As noted in Chapter 4 in the discussion of the water management strategy known as the Luce Bayou Transfer, there is a serious impact of this project on bottomland hardwood and other natural ecosystems providing habitat for a diversity of wildlife. Even the off-channel Little River Reservoir project might inundate habitat for the Houston Toad and Interior Least Tern and require mitigation. Allens Creek Reservoir also has the potential to impact wetlands

habitat. Given the dramatic demonstration recently of the significance of coastal wetlands, the potential impact of these projects on such wetlands and related habitats requires more extensive evaluation.

All of these projects will be required to avoid, minimize, or mitigate these potential impacts to important natural ecosystems to the maximum extent practicable during the detailed facility planning and permitting process which must follow.

66) Section 7.3.3, Impacts of Water Management Strategies on Unique Stream Segments. More information should be provided about the concern that overuse of groundwater would impact spring flows within Sam Houston National Forest.

The concern about groundwater use affecting spring flows in the National Forest was raised by the Houston Regional Group of the Sierra Club, and highlighted in the text at their suggestion. To date, they have provided no further information on the subject. We concur that this is a legitimate concern that further supports the need for appropriate reductions in the increased use of groundwater within this area; however, we have no additional information available to include in the plan regarding this issue.

67) Section 7.3.4, Impacts of Water Management Strategies on Galveston Bay. The authors again reiterate our concerns about relying on water management strategies (increased wastewater flows) from Region C to assure maintenance of inflows to Galveston Bay and about changes in inflow patterns resulting from the implementation of certain Region H water management strategies.

Your concern is noted.

68) Section 8.1, Unique Stream Segments. The authors support the recommendation that the following six stream segments in Region H be designated as "unique stream segments:" Armand Bayou, Austin Bayou, Bastrop Bayou, Big Creek (Fort Bend), Big Creek (San Jacinto), Cedar Lake Creek, Menard Creek, and Oyster Bayou.

The RHWPG appreciates your support.

69) Section 8.2, Unique Reservoir Sites. The authors oppose the recommendation that the sites for Little River Off-Channel Reservoir, Bedias Reservoir, and Little Reservoir be designated as unique reservoir sites. Among other concerns, there is no clear definition of each reservoir site, there is no discussion of whether and to what extent such a designation impacts the property value or resale of property within the designated area would be, and there is no real need for any of these reservoir projects.

Your concerns are noted.

70) Regulatory, Administrative and Legislative Recommendations. The authors addressed four recommendations: They support the recommendation that the Legislature adopt the recommended stakeholder process for determining bay and basin environmental flow requirements, and include Region H and the Galveston Bay Freshwater Inflows Group (GBFIG) in the Galveston Bay stakeholder group. They oppose the recommendation to "maintain the current rule of capture basis of groundwater law within Texas in all areas not subject to defined groundwater conservation districts." They support the recommendation to "implement the programs recommended by the Water Conservation Implementation Task Force." They are concerned about the recommendations for more "flexibility" in the use of alternative water management strategies and "modification" of notice requirements for regional plan amendments ("the devil is in the details").

The RHWPG appreciates your concerns.

71-74) Chapter 10, Public Involvement. The authors appreciate the extensive documentation of public participation provided by the Region H water planners in this chapter, the openness that the RHWPG has shown to our organizations, the change that was made in the format of the RHWPG meetings to provide the opportunity for public comment at more opportune times during the meetings rather than at the end of the meetings, and the opportunity that was provided by the RHWPG to have the Region H planning consultants make a presentation on the draft 2006 plan to a special public meeting co-hosted by Galveston Bay Foundation and the Sierra Club in August of this year. We are concerned, however, about the relatively low level of public participation at the meetings of the RHWPG and the public hearings held by the planning group – outside of consultants, government officials, and professional advocates. We are also concerned about the difficulty in obtaining materials prior to the RHWPG meetings that relate to agenda items at the meetings – hampering the ability to provide meaningful and helpful public input to the planning group members at the meetings. We would strongly urge the RHWPG to take steps to enhance the ability of the public to have the information to participate effectively in the regional planning process and to facilitate their ability to attend meetings and keep up-to-speed with the planning process. To that end we would recommend that the RHWPG do the following: (1) Establish a separate website for Region H to which planning materials, meeting notices, and other such items could be posted electronically in advance of meetings and hearings; (2) Consider holding RHWPG meetings at a more easily accessible location than the San Jacinto River Authority offices; (3) Consider holding at least some of the RHWPG meetings in the evening to allow more people who work during the day to attend a meeting and monitor the process.

The RHWPG appreciates the cooperation and participation of your agencies in the planning process. The planning group has tried to facilitate public participation during the process, but finds that varying the meeting times and locations creates difficulties for group member attendance without significantly increasing public attendance. We are interested in discussing ways of better notifying the public of meetings.

The Consultant Team would like to point out that during the past year, their schedule was to distribute and present draft plan chapters at a regular RHWPG meeting, and then discuss and receive comments on these chapters at the following two meetings. This schedule met the needs of the planning group.

Thank you for your comments.

Sincerely,

David Parkhill, P.E.
Project Principal

c: Region H Water Planning Group
Region H Consultant Team

Texas Wildlife Association
"Working for tomorrow's wildlife ... TODAY!"
401 Isom Rd., Suite 237 • San Antonio, TX 78216 • 210/826-2904 • 800/839-9453 • FAX 210/826-4933

September 21, 2005

Mr. Jim Adams
Chairman, Region H Water Planning Group
San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305-0329

Dear Mr. Adams:

Thank you for leading Texas' vital water planning efforts. At the Texas Wildlife Association (TWA), we support customized solutions created as close to the affected resource as possible; therefore, we appreciate your planning committee's ongoing commitment to the resources in your care.

The TWA is a non-profit organization representing private land stewards, land managers, hunters and anglers from across the state of Texas. Our members care for and control more than 30 million acres of rangeland and wildlife habitat that are key components of Texas' upstream watersheds. The involvement of private land stewards is critical in establishing Texas' long-term water policies.

As you finalize your regional plan, we would be remiss if we did not bring voluntary land stewardship to your attention again. The relationship between the land's condition and the quality and quantity of water available to Texans is inextricably linked. In fact, good land stewardship encompasses a myriad of activities far beyond brush control. (For an all-encompassing definition and discussion of land stewardship, please see the attached Handout A and the November 2005 edition of "At Issue" written by Robert L. Cook, Executive Director of the Texas Parks & Wildlife Department.) Private landowners who optimize the condition of their land are effectively engaged in water ranching, in addition to the more visible activities of raising cattle or managing wildlife.

Open space land is Mother Nature's sponge, capturing water for both our underground and surface supplies. The land's condition determines how much water is captured for our aquifers, rivers, lakes, streams, bays and estuaries or how much water is lost to detrimental run-off and evaporation.

Incorporating good land stewardship into any water plan makes sense because, voluntary land stewardship is:

***Complementary:** Optimizing the condition of Texas' rural water catchments (also known as watersheds) ensures the increased effectiveness of any other water supply strategies that may be implemented. Years of scientific research has shown that effective, efficient rural water catchments will provide more water, better water and more options for water planners. Good land stewardship is the foundation upon which all other water supply strategies should rest.

***Cost-effective:** Improving the condition of the state's rural water catchments is relatively inexpensive. The cost for generating additional water through voluntary land management practices is dozens of dollars per acre-foot, and sometimes it's no-cost. Other proposed methods generate additional water at the cost of hundreds or thousands of dollars per acre-foot.

***Sustainable:** Responsible, voluntary land stewardship is a sustainable practice. Once people begin to implement the best management practices necessary to optimize the range in their particular location, those practices can continue uninterrupted.

***Efficient:** Good, voluntary land stewardship does not make more rain; it just makes the most of what we receive. Obviously, a well-managed landscape with 75 percent rainfall efficiency captures more usable water than a poorly managed one with 25 percent efficiency. With 75 percent rainfall efficiency, the landscape could benefit from increased water percolation and vigorous plant performance. With 25 percent rainfall efficiency, the landscape will operate under drought conditions even in years with normal rainfall.

***Environmentally Sensitive:** Good, voluntary land stewardship practices not only optimize the rural water catchments, but also provide exceptional wildlife habitat while conserving our state's remaining open space land. Good, voluntary land stewardship solves problems rather than creates them.

***Multi-faceted**: Good, voluntary land stewardship practices are not a "one size fits all" proposition. Each ecological region may require a different set of management practices to achieve the best results, and we will see more immediate results in some ecological regions than in others. Fortunately, this creates a great deal of flexibility, allowing prioritization and long-term planning.

While brush management can be part of good land stewardship, it is not the only option for rangeland management and improvement; therefore, Best Management Practices (BMPs) should be part of any cost-share, public-private program and/or contract. The BMPs should consistently include range re-seeding and livestock deferment to successfully establish native vegetative stands as well as good follow-up grazing management.

***Governable:** In order to promote even better land stewardship, policy makers should consider implementing Best Government Practices (BGPs). BGPs, as used in other states, provide a wide range of options that might include: increased cost-shares at targeted, prioritized water enhancement sites; increased technical assistance in range and wildlife management planning; a system of Purchases of Development Rights to keep priority properties together under good management; and reduced valuations, tax breaks, or other incentives for participation in water enhancement management practices.

Voluntary land stewardship is the logical place for water management to begin because land stewardship affects the water supply at its origins, not just at its destination. We find it difficult to understand why people charged with water management focus their efforts on destination and demand, while virtually ignoring the issues of origination and supply. If we maximize the effects of the rainwater that falls from the sky, then the answers to questions of demand are much more easily answered.

Water harvesting provides one example of water-induced tunnel vision. In most water plans, a great deal of space is dedicated to water harvesting, collecting the rainwater that falls on roofs – roofs that are generally measured in square feet. But yet, these same plans ignore the millions of acres of "unroofed" rangeland that are the foundation for the region's water catchment. Why? The rainwater harvested from rural grasslands, savannahs, forests, and wetlands is not as easily visible as that collected from urban rooftops.

Ground and surface water supplies originate with the rain that falls on the land and is captured by a complex, large-scale process involving plants, soil and animals. When the process functions optimally, floods are reduced, aquifers are replenished, and water is released more slowly and steadily into streams, rivers, lakes and eventually our bays and estuaries. If the land is in good condition, the quality and quantity of water – both surface and underground – available to citizens reflect that condition. When the process is working well across millions of acres of open, rural land the contribution to the state's water supply can be tremendous.

Interestingly, when conscientious land stewards ably manage their resources as they do every day, they are ranching water just as surely as they are ranching cattle, sheep, goats or wildlife. Unfortunately, this contribution is overlooked or misunderstood. We must include voluntary land stewardship – on a grand scale – as one of the foundation solutions for water issues in Texas.

When it comes to water policy, good land stewardship is like the first step on a staircase. The staircase will stand if you remove the last step, a middle step or even the second step, but the staircase will come crashing down if there is no first step. Please help Texas ensure that this very vital first step is in place as the foundation of planning for our future.

To help you incorporate voluntary land stewardship into your plan, we have taken the liberty of enclosing our report, "Texas' Looming Water Crisis: Recognizing Land Stewardship's Untapped Potential," which we believe would fit your purposes well. Please use the information to help Texans secure their future.

If you have any questions, please do not hesitate to contact us using the information below.

Yours for a clean and enjoyable outdoors,

Kirby L. Brown
Executive Vice President
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"Working for tomorrow's wildlife ... TODAY!"
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Handout A

What is Voluntary LAND STEWARDSHIP?

(It's a lot more than just brush control...)

- Absorbing Rainfall/Reducing Run-Off/Increasing Base-Flow
- Using Prescribed Fire Properly
- Planning and Managing Grazing (Including Deferment...)
- Managing Brush Appropriately (It's never controlled, and some of it's important for wildlife!)
- Managing Erosion
- Reseeding With Natives (As Necessary...)
- Wildlife and Habitat Management Plans
- Managing and Restoring Riparian Areas
- Protecting Springs and Creek Banks
- Increasing Bio-Diversity
- Conserving Rare Species
- Limiting Habitat Fragmentation with Appropriate Estate Planning
- Being a Good Neighbor
- Contributing to Your Community
- Conserving Aquifer Recharge Areas
- Managing Exotic Species (Flora and Fauna) as Appropriate
- Investigating Existing and New Incentive Programs (PDRs, CRP, GRP, LIP, etc.)
- Being Open to New Ideas, Constantly Evaluating Plans/Methods, and Adjusting as Indicated
- Getting Informed, Getting Involved, VOTING, etc.

Land stewardship shifts thinking and vocabulary because good land stewardship allows the land to catch water instead of shed it.

Rural land is a water CATCHMENT not a waterSHED!!!!

David K. Langford • Vice President Emeritus • Texas Wildlife Association
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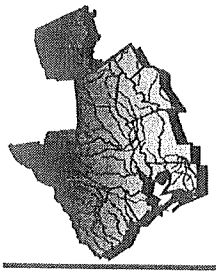

REGION H WATER PLANNING GROUP
Senate Bill 1 - Texas Water Development Board
c/o San Jacinto River Authority
P. O. Box 329, Conroe, Texas 77305
Telephone 936-588-7111 Facsimile 936-588-3043

October 31, 2005

Mr. Kirby L. Brown
Executive Vice-President
Texas Wildlife Association
401 Isom Road, Suite 237
San Antonio, Texas 78206

Mr. David K. Langford
Vice President Emeritus
Texas Wildlife Association
P. O. Box 1059
Comfort, Texas 78013-1059

Re: Initially Prepared 2006 Region H Water Plan

Dear Mr. Brown and Mr. Langford:

The Region H Water Planning Group (RHWPG) appreciates your comments and input on the Initially Prepared 2006 Region H Water Plan. Your comments about the importance of voluntary land stewardship will be considered by the RHWPG and will be incorporated into the document that is submitted to the Texas Water Development Board in January 2006. Thank you again for making your views known.

Sincerely,

Jim Adams

Jim R. Adams, P.E.
Chair, Region H Water Planning Group

TEXAS WATER DEVELOPMENT BOARD

September 28, 2005

Mr. Jim Adams, P.E.
Chairman, Region H Water Planning Group
San Jacinto River Authority
1577 Damsite Road9
Conroe, TX 77304

Re: Texas Water Development Board Comments for the Region H Water Planning Group (Region H) Initially Prepared Plan, Contract No. 2002-483-468

Dear Mr. Adams:

Texas Water Development Board (TWDB) staff completed a review of the Initially Prepared Plan (IPP) submitted May 31, 2005 on behalf of the Region H Planning Group. The attached comments addressing the IPP follow a format similar to those used in developing the prior regional plans, including:

- Level 1: Comments and questions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements; and
- Level 2: Comments and suggestions for consideration that may improve the readability and overall understanding of the regional plan.

In addition, the TWDB reserves the right to submit additional Level 1 comments as missing or incomplete materials become available. Comments will be provided after review of the online database (DB07) is complete. Also, the TWDB's statutory requirement for review of potential interregional conflict will not be completed until all applicable data and information has been provided by any potentially affected planning group. TWDB's streamflow assessment, based on full implementation of the region's IPP, will be provided under separate cover.

Title 31, Texas Administrative Code §357.11(b) requires the regional water planning group to consider timely agency and public comment. Section 357.10(a)(3) of the TAC requires the final adopted plan include summaries of all timely written and oral comments received, along with a response explaining any resulting revisions or why changes are not warranted.

If you have questions, please do not hesitate to contact Bill Roberts at (512) 936-0853.

Sincerely,

William F. Mullican III
Deputy Executive Administrator
Office of Planning

Attachment

c w/att.: Mr. Andrew Sterbenz, P.E., KBR
Mr. David Parkhill, P.E., TC&B, Inc.

Attachment

Region H Regional Water Plan Comments

LEVEL 1—Comments and questions must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements.

Chapter 1: Description of the Region

1. Page 1-21: Identify and discuss areas with high arsenic levels and radon problems in the region. *[TAC (TAC) §357.7(a)(1)(C)]*

Chapter 2: Presentation of Population and Water Demands

2. Page 2-42: The basin splits provided in Table 2.2 for the manufacturing water demand projections for Brazoria County are not the TWDB approved basin splits. Please ensure that any Basin total tabulations include the correct splits for manufacturing for Brazoria County. The table below compares the numbers from the IPP with TWDB approved numbers. *[TAC §357.5(d)(1)&(2)]*

Brazoria County Manufacturing								
Source	Basin	D2000	D2010	D2020	D2030	D2040	D2050	D2060
IPP	San Jacinto - Brazos	36,014	42,231	46,501	50,280	54,094	57,461	61,541
IPP	Brazos	184,906	216,824	238,749	258,151	277,737	295,021	315,974
IPP	Brazos-Colorado	1,010	1,184	1,304	1,410	1,517	1,611	1,726
IPP	County Total	221,930	260,239	286,554	309,841	333,348	354,093	379,241
TWDB	San Jacinto - Brazos	71,962	84,385	92,917	100,468	108,089	114,817	122,970
TWDB	Brazos	147,950	173,488	191,031	206,556	222,228	236,057	252,822
TWDB	Brazos-Colorado	2,018	2,366	2,606	2,817	3,031	3,219	3,449
TWDB	County Total	221,930	260,239	286,554	309,841	333,348	354,093	379,241

Chapter 3: Analysis of Current Water Supplies

3. Identify whether any interregional conflicts exist. *[TAC §357.14(3)]*
4. Page 3-48: Clarify if the Bluebonnet Groundwater Conservation District's certified groundwater management plan was considered as a basis for determining groundwater availability. *[TAC §357.5(k)(1)(D)]*
5. Report surface water supply by categories of water use for each county or portion of county in the region and by river basin, if the county is in more than one basin. Report surface water supply by categories of water use for Wholesale Water Providers by river basins. *[TAC §357.7(a)(3)(A)(iv) and TAC §357.7(a)(3)(B)]*

Chapter 4: Identification, Evaluation and Selection of Water Management Strategies Based on Needs

6. Verify that the plan protects option agreements or special water resources. *[TAC §357.5(e)(3)]*
7. Ensure and reference that discounted present value costs were utilized for evaluation of the water management strategies. *[Contract Exhibit "B," Section 4.2.9]*
8. Chapter 4: Describe the process used to identify potentially feasible water management strategies. *[TAC §357.5(e)(4)]*
9. Supplemental Task 1, Subtask 5: Please provide data used to assess inflow impacts on spatial water quality in Galveston Bay. *[Contract Exhibit "C," Section 2.2, Page 13]*
10. Supplemental Task 4, subtask 6: Please provide information indicating coordination with Region I to resolve differences on the transfer of Toledo Bend Reservoir water to Region H. *[Contract Exhibit "C," Page 15]*
11. Provide information on the need for the water in the basin of origin and in the proposed receiving basin based on the period for which the water supply is requested within the 50 year planning horizon. *[TAC §357.7(a)(8)(F)]*
12. Appendix 4A: Ensure that mitigation costs were included, as appropriate, in evaluating costs the costs of water management strategies.
13. Appendix 4B10: Please provide cost information for the strategy titled Wastewater Reclamation (Reuse). *[Title 31, TAC, §357.7(a)(8)(A)(i)]*

14. Appendix 4B11: Please provide cost information for the strategy titled NHCRWA Wastewater Reclamation for Industrial Use and Municipal and Commercial Irrigation. *[Title 31, TAC, §357.7(a)(8)(A)(i)]*

LEVEL 2—Comments and suggestions that might be considered to clarify or help enhance the plan.

Executive Summary

15. Consider providing summary tables of projected water needs and the amounts of water expected to be provided by the WMSs.

Chapter 2: Presentation of Population and Water Demands

16. Page 1-19: Section 1.1.4, Titled Major Water Providers: Change reference from Major Water Providers to Wholesale Water Providers.

Chapter 3: Analysis of Current Water Supplies

17. Page 3-45: Consider identifying the "various sources" used to determine groundwater availability.

18. Page 3-23: Consider modifying Figure 3-8, and all subsequent figures and maps, so they can be reproduced and remain legible in black and white.

Chapter 4: Identification, Evaluation and Selection of Water Management Strategies Based on Needs

19. Page 4-12: Table 4-4 lists the start date for the Houston to GCWA Transfer as 2050. Table 4A-3 lists the start date as 2010. Quantity is listed as 28,000 acre-feet per year in Table 4-4 and both 14,000 and 42,000 acre-feet per year in Table 4A-3. Consider clarifying these apparent contradictions.

20. Page 4-12, Table 4-4, Appendix 4B18-1 and Appendix 4A Table 4A-3: Consider clarifying the different costs that appear for the Freeport Desalination strategy. Capitol costs range from $85,000,000 to $255,000,000 and total strategy costs range from $745,765,000 to $959,710,000.

21. Appendix A: Consider listing conservation for each WUG in Table 4A.7.

22. Appendix 4A: Consider explaining the two "Strategy Cost" values for the "Houston to GCWA Transfer" listed in a single cell of Table 4A-3

23. Appendix 4A: Consider including definitions of "Strategy Cost ($)" and "Cost of Water ($/ac-ft)" for Table 4A.3.

24. Appendices B and C: Consider providing the assumed construction period for which interest is shown on cost of strategies.

25. Appendix 4B1-3, 2nd paragraph: Consider including copies of the conservation BMP survey forms and responses.

26. Appendix 4B1-3, 3rd paragraph: Consider noting whether Region H utilized the TWDB report "Quantifying the Effectiveness of Various Water Conservation Techniques in Texas" in its evaluation of conservation savings and costs.

27. Page 4-12 Table 4-4 and 4B18-5 Table 2: Consider removal of "net" in the title of the table and the explanation in Footnote 4 to "groundwater usage" as the Freeport Seawater Desalination Project strategy does not include groundwater usage.

Chapter 5: Impacts of Water Management Strategies on Key Parameters of Water Quality Impact of Moving Water from Rural and Agricultural Areas

28. Page 5-12, last paragraph: Consider providing further explanation of what is meant by "contractual and institutional measures."

Chapter 6: Water Conservation and Drought Management Plans

29. Page 6-1, 2nd bullet: Consider deleting the reference to May 1, 2005 since the date has passed.

Chapter 7: Long-Term Protections of the State's Water Resources, Agricultural Resources and Natural Resources

30. Consider referencing the appropriate appendix when discussing the strategy in the text.

October 29, 2005

Mr. William F. Mullican
Deputy Executive Administrator, Office of Planning
Texas Water Development Board
1700 N. Congress Ave.
Austin, TX 78711-3231

Subject: Response to TWDB Comments on the Initially Prepared 2006 Region H Water Plan.

Dear Mr. Mullican:

The following letter provides responses from the Region H Regional Water Planning Group Consultant Team to the comments on the Initially Prepared 2006 Region H Water Plan (IPP) which you provided in your letter dated September 28, 2005. We have directly coordinated with Bill Roberts and other Board staff in resolving open issues.

Level 1 Comments:

1. Page 1-21, Identify and discuss areas affected with high arsenic levels and radon problems.

The section was updated.

There are many naturally occurring constituents in ground water with arsenic and radon being two of them. The current maximum contaminant level (MCL) for arsenic in water used for pubic supply is 0.05 mg/l with the MCL scheduled to be lowered to 0.01 mg/l in January of 2006. Currently ground water produced within Region H has an arsenic content below the existing MCL. There is a limited area within the northwest part of Harris County where the concentration of arsenic in some sands of the Gulf Coast aquifer exceeds 0.01 mg/l. Wells are now constructed to not screen these sands and in some instances consideration is being given to treating the water from older wells to lower the arsenic content below 0.01 mg/l.

Radon is not a regulated constituent as an MCL has not been established for it. There are some areas in the west part of Harris County where isolated sands can contain water with higher concentrations of radon. Through geophysical logging to identify these depth intervals and by the use of well construction techniques that isolate the sands from providing water to a well, production wells are constructed that produce water with low levels of radon.

2. Page 2-42, correct the basin split for Brazoria County Manufacturing to match the TWDB approved data.

The Manufacturing demand data for Brazoria County was corrected in August 2005 to reflect an error in recording the 2000 water use survey. The survey response in error was for a Brazos River water right, and the associated demand should have been allocated to the Brazos basin, as reflected in the IPP, rather than split between three basins. We have contacted the TWDB staff and coordinated a correction to the State Data Set.

3. Chapter 3, Identify whether any interregional conflicts exist.

The RHWPG coordinated with Regions C and I on February 18, 2005 to ensure that interregional contracts and known future water sales were correctly reflected in the plans. We will add a statement in Chapter 3 to clarify this.

4. Page 3-48, clarify if the Bluebonnet GCD's certified groundwater management plan was a basis for determining groundwater availability.

The certified groundwater management plan for the Bluebonnet Groundwater Conservation District was used as a basis for estimating groundwater availability in Austin and Walker Counties. The certified groundwater management plan for the Lone Star Groundwater Conservation District was used as a basis for determining or estimating groundwater availability in Montgomery County. The regulatory plans of the Harris Galveston Coastal Subsidence District and Fort Bend Subsidence District were used for determining groundwater availability in Harris, Galveston and Fort Bend Counties.

5. Chapter 3, report surface water supply by categories of water use in each county and basin, and report WWP surface water supply by category of water use and basin.

Tables 3-15 and 3H-2 have been added to the report to present this data.

6. Verify that the plan protects options agreements or special water resources.

No special water resource designations were identified within Region H, but there are several supply sources that meet the special resource criteria of serving more than one region. These are Lake Livingston, the Lakes Rayburn and Steinhagen system, and the Brazos River Authority System. A clarification will be added in the text, explaining that all inter-regional contracts were honored and future use was coordinated with the appropriate adjacent region.

Where options agreements were by Wholesale Water providers, they were reflected in the plan as either current contracts or increases to current contracts. Text will be added to section 3.4 to clarify.

7. Ensure and reference that discounted present value costs were used for evaluation of the water management strategies.

For evaluation of water management strategies, costs were estimated in 2002 second quarter prices per Appendix 4C Cost Estimating Procedures. This was done so that the management strategies can be compared on an equal basis without taking into consideration what decade the strategies are implemented. Discounted present value costs were used to calculate WUG costs after the management strategies had already been screened and selected so that the time value of money could be taken into consideration for a more realistic cost estimate for implementation. Table 4C-1: Regional Infrastructure Cost Estimate and Table 4C-2: Water User Groups Requiring Facilities utilize discounted present value costs and will be footnoted on tables.

8. Describe the process used to identify potentially feasible water management strategies.

An explanation was added to Section 4.2. [Potentially feasible strategies were identified in three ways. First, strategies recommended in the 2001 Region H Water Plan for either implementation or additional study were considered potentially feasible. Next, new strategies were solicited during the scope development period for the 2006 Water Plan. Finally, sponsoring agencies that conducted independent strategy studies were contacted and could bring their reports to the planning group and request they be

considered in the plan. As examples, the Brazos Saltwater Barrier was a strategy developed during the scoping period, and the two municipal wastewater reclamation strategies were brought to the RHWPG by their local sponsors during the planning cycle.]

9. Provide data used to assess inflow impacts on spatial water quality in Galveston Bay.

The RHWPG was funded only to model flow quantity into Galveston Bay using the WAM. The WAM model and results have been submitted to the TWDB for use in updating the TXBLEND salinity model, which will provide the spatial water quality data.

10. Provide information indicating coordination with Region I to resolve differences on the transfer of Toledo Bend Reservoir water to Region H.

On February 10, 2005, a conference call involving Regions C, H, and I consultants occurred to discuss the quantity of water that Region H was planning to utilize, known as East Texas Water Strategy. A volume of water was agreed upon that would not effect their current strategy. Further discussion would most-likely have to occur to resolve political differences of the actual strategy being implemented. The Region H planning group did not select the East Texas Water Transfer Strategy as recommended, however it remains a future alternative for the Region if another strategy fails to materialize. Text will be added to the management strategy technical memorandum reflecting this coordination.

11. Provide information on the need for water in the basin of origin and in the proposed receiving basin for all interbasin transfers.

The Region H Plan recommends transferring supply from the Neches to Trinity River Basin for irrigation, and from the Trinity to San Jacinto River Basin for municipal and manufacturing.

Supply from Lake Steinhagen in the Neches Basin is contracted from the Lower Neches Valley Authority. This contract is under the existing interbasin transfer permit, and comes from the unallocated surplus within that lake.

Supplies from Lake Livingston and other lower Trinity water rights are recommended for transfer into the San Jacinto Basin. These are also previously permitted interbasin transfers, which were recommended after all in-basin demands were satisfied. This information will be added to the Luce Bayou Interbasin Transfer WMS.

12. Ensure that mitigation costs were included, as appropriate, in evaluating the costs of water management strategies.

Environmental studies and mitigation costs were included in cost estimates for water management strategies in a single line item on an individual project basis. For reservoirs, mitigation costs were generally equal to the land value of the acreage that would be inundated. Mitigation cost is included, but not listed separately in the management strategy screening tables.

13. Appendix 4B10: provide cost information for the Wastewater Reclamation strategy.

Costs information will be added to the technical memorandum based on data developed during the supplemental study.

14. Appendix 4B11: provide cost information for the NHCRWA Wastewater Reclamation strategy.

Costs information will be added to the technical memorandum based on data developed during the supplemental study.

Level 2 Comments:

15. Consider providing summary tables of projected water needs and the amounts of water expected to be provided by the WMS.

Table E-11 provides that data by County. The initial shortage entry in the table is the unmet demand.

16. Page 1-19: Change reference from Major Water providers to Wholesale Water Providers.

The term Major Water Provider is defined in that section as provider of 100,000 ac-ft/yr or greater, and therefore excludes most wholesale providers. The discussion points out that a few large entities hold the majority of the surface water rights, and will be left unchanged. Wholesale providers are identified and discussed in Chapter 3.

17. Page 3-45, consider identifying the "various sources" used to determine groundwater availability.

Groundwater availability in Austin, Leon, Madison, Walker, Montgomery, Harris, Galveston and Fort Bend Counties was estimated utilizing information from certified groundwater management plans or regulatory plans of groundwater conservation or subsidence districts that exist in the counties. Groundwater availability within these counties constitutes the vast majority of groundwater available within Region H. Groundwater availability within other counties in Region H was determined utilizing information from past planning and groundwater studies and from estimates provided by the TWDB.

18. Page 3-23, consider modifying Figure 3-8 and subsequent figures so they will remain legible in black and white.

We will update the figures using hatch patterns, where possible.

19. Page 4-12, clarify apparent contradictions in the listing of the Houston to GCWA Transfer WMS in Table 4-4 and 4A-3.

The figure given in Table 4-4 represents both options that are discussed in the subject WMS. Another date will be added to the starting decade column of Table 4A-3 so it will be apparent that there are two options. One option supplies 14,000 acre-ft by 2010 and the other option supplies up to 42,000 acre-ft by 2060.

20. Page 4-12, clarify apparent contradictions in the cost of the Freeport Desalination WMS in Table 4-4, Table 4A-3 and appendix 4B18.

Changes will be made to Table 4A-3 to reflect the correct costs associated with this strategy.

21. Consider listing conservation for each WUG in Table 4A-7.

Because some WUGs have already achieved low usage rates (well below the Water Conservation Task Force goal of 140 gpcd), it would not be practical to expect increased conservation from every WUG.

However, in response to other comments, we will estimate and reflect the water savings from energy efficient clothes washers for all municipal WUGs.

22. Explain the two strategy cost values for the Houston to GCWA transfer WMS in Table 4A-3.

Another date will be added to the starting decade column of Table 4A-3 so it will be apparent that there are two options.

23. Table 4A-3, include definitions of the "Strategy Cost" and the "Cost of Water."

Footnotes will be added to include definitions.

24. Appendices 4B and 4C, provide the assumed construction period where interest during construction is shown as a cost item.

Since costs for management strategies in Appendix 4B follow estimating procedures documented in Appendix 4C, the assumed standard construction period of two years will be noted in Section 1.15 of Appendix 4C. The cost tables in Appendix 4C do not show interest during construction as a separate cost item.

25. Appendix 4B1, consider including the conservation BMP survey form and responses.

Without prior notification to the parties that responded to the survey, the surveys will not be published within the plan.

26. Appendix 4B1, consider noting whether the TWDB report "Quantifying the Effectiveness of Various Water Conservation Techniques in Texas" was used in this evaluation.

The TWDB Report was not utilized in determining the expected savings or costs for this strategy. However, some of the BMPs used to determine expected savings are BMPs discussed within the TWDB Report. For purposes of determining savings and costs, BMPs utilized by a major water supplier within the Region and their associated costs and realized savings were used. We do state within the water conservation strategy technical memorandum that any of the BMPs could potentially be used for water conservation, but for purposes of the Region H plan we based goals on actual data from a local water supplier.

27. Page 4B18-5, Table 2, consider removing the word "net" in the title of the table and update footnote 4.

The information contained in this table was extracted from the Brazos River Authority – Freeport Seawater Desalination Project Final Report and adjusted to reflect 2nd quarter 2002 dollars. Therefore, the table title will be changed to reflect the correct title - Summary of Net Present Value Analysis.

28. Page 5-12, consider providing further explanation of what is meant by "contractual and institutional measures."

Reference to contractual and institutional measures will be removed from the sentence.

29. Page 6-1, 2nd bullet, consider deleting the reference to May 1, 2005.

The date comes from the legislation, and is provided to show the transitional milestone, which occurred during the planning period.

30. Chapter 7, consider referencing the appropriate appendix when discussing a WMS in the text.

We will insert a general reference to the WMSs in Appendix 4B.

Please contact us if any of these proposed corrections do not satisfy the Board's requirements.

Sincerely,

David Parkhill, P.E.
Project Principal

c: Region H Water Planning Group
Region H Consultant Team

D. Other Written Comments and Responses

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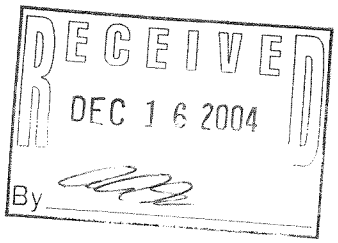

December 14, 2004

Mr. Jim Adams
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and

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Dear Jim and Andrew,

Enclosed are the comments of the Houston Regional Group of the Sierra Club (Sierra Club) regarding the draft of Chapters 1, 2, and 6 for the revised Region H Water Plan.

Chapter 1, Description of Region

On page 1-1, 1.1 Regional Water Planning in Texas, the water planning time frame of 2000-2050 is given. In Chapter 1 (**page 1-10, 1.4.3 Use by Source**) the time frame of 2000-2060 is used. Why are these two time frames different? If a 50-year time frame is to be used the time frame should be 2005-2055. Please explain to the public this discrepancy.

On page 1-15, 1.4 Region H Water Supply Sources and Providers, it is stated that "reused and recycled water and saline sources are additional supply sources utilized in Region H." There are plans to use saline aquifers in the Gulf Coast of Texas as carbon sequestration reservoirs for CO2. What impacts will carbon sequestration have on the use of saline aquifers for water supply purposes?

On page 1-15, 1.4.2 Surface Water Sources, it is stated that "There are no major springs located within Region H. The definition of "major springs" must be

provided for public review, comment, and understanding. It is not just major springs that should be of concern in the Region H Water Plan. Other springs, shallow water aquifers, aquifer supplied stream flow, recharge areas, and sensitive plant and animals communities that depend on aquifer water (for example, bogs and seeps) in Sam Houston National Forest and other locations in the region must be discussed, the impacts this plan will have on these groundwater issues, and the biological and ecological mitigation that will be required to reduce the impacts.

On page 1-20, 1.4.3, Table 1-9, please explain what the Sam Rayburn Contract in the Neches Basin is. The public should have a right to review, comment, and understand that this is.

On page 1-21, 1.4.4 Major Water Providers, it is stated that the Chambers-Liberty Counties Navigation District has rights to over 100,000 acre-feet/year that is primarily used for irrigation. Region H should also inform the public that the District has applied to allow it to change the use of this water to municipal and other uses.

On page 1-21, 1.4.4 Major Water Providers, what does "100% reliable" mea? Region H should tell the public so that it can review, comment, and understand what this means.

On page 1-23, 1.5.1 Water Quality, the Lower Brazos River has high levels of dioxin in sediments and has had a health advisory published by the Texas Department of Health. This issue should be discussed in this section.

On page 1.6.1 Existing Regional and Local Water Management Plans, first paragraph water conservation should be required for all users and uses and not just for "municipalities".

On page 1.6.1 Existing Regional and Local Water Management Plans, third paragraph, it states that "Various management strategies would need to be implemented to accommodate growth?" Why does Region H need to accommodate growth? What is the growth target that Region H must accommodate? How can this be done and not diminish the quality of life of citizens? What will this cost? Who will pay? Who will be subsidized? What are the costs on the environment? What are citizens willing to pay or are willing to accept as decreased or degraded environment to accommodate growth? The statement "accommodate growth" by itself should not be looked upon as a mandate.

The HSC is very concerned about interbasin transfers because they ensure that our children and children's children have fewer options and that different regions of Texas will have to sacrifice their options to accommodate the options of other regions.

On page 1-30, Notification Procedures for Regional Plan Amendments, the HSC is not in favor of allowing all Regional Plan amendments to bypass the present amendment procedure. Public review and comment opportunities are needed to ensure that the people who will pay and or suffer the consequences of any actions have the opportunity to voice their views. Already Region H Planning Group has recommended major amendments to the 2001 plan that will sew up all the unappropriated water in the San Jacinto River Basin. If this proposal was in affect now this major change would have been approved with little public review and comment opportunities.

On page 1-32, Interbasin Transfers, the HSC is not in favor of additional interbasin transfers. Each Region and river basin must learn to live within its means, its carrying capacity so that its actions do not impinge or diminish the opportunities for other regions or parts of regions to use their water resources. The HSC does not support removing barriers to make interbasin transfers easier. The HSC does not favor allowing junior water right holders to shove aside the needs of senior water right holders.

Chapter 2, Presentation of Population and Water Demands

The HSC is very concerned that the RHWPG and the TWDB are preordaining what Region H's population will be in 2060. Instead of having a public debate about what population the State of Texas and the Houston area would like to have in 2060 Texans and Houstonians are being told that they must plan for a population that grows to more than double its size in Texas (from 21 million to 45 million) and in Region H (from 4,848,918 to 10,897,526).

Population projections are the very foundation of all planning, including water use, in Texas. But RHWPG and the TWDB do not know what Texans want. RHWPG and the TWDB do not ask what Texans and Houstonians want. RHWPG and the TWDB are not telling Texans and Houstonians what more than doubling the population will mean for them, their children, and grandchildren regarding air quality, water quality, noise, light pollution, traffic congestion, green space and parks, farmland, social services, quality of life, etc.

The RHWPG and TWDB projects the population first; does not take into consideration what the environment and quality of life will be like before making this projection or even after this projection is made; does not determine what Texans and Houstonians want their environment and quality of life to be like before this projection is made; assumes Texans and Houstonians want more than a doubling of the population; and then plans for water use based on this more than doubling of the population.

Water demands are based on implementing a plan that has made a policy decision with no public policy debate and that is not backed by Texans and

Houstonians. This policy decision decides what population growth Texans and Houstonians will endure and does not determine what population growth Texans and Houstonians want.

By not conducting this public policy debate RHWPG and the TWDB ensure that construction of water projects and infrastructure for 45 million people will occur and that we will, in all probability, utilize these facilities to grow to 45 million people in 2060. By conducting water planning this way RHWPG and the TWDB implement the fallacy that "Trend is Destiny." Texans and Houstonians are not preordained to have a continuing growth in population or a growth in population that is the size that RHWPG and the TWDB says we will have.

There are many public policy questions that must be answered by Texans and Houstonians before population projections are made. Some of these include:

1) What population do we want?
2) What population can we handle (so we do not exceed natural carrying capacities)?
3) Is growth in population good or bad?
4) Do we need growth in population?
5) Why do we need growth in population?
6) How much population growth should we have?
7) What quality of population growth do we want?
8) What can we do to reduce population growth?
9) Why don't we reduce population growth?
10) How much immigration is good?
11) How much immigration is bad?
12) How can we control population growth?
13) How can we implement birth control, sex education, and family planning?
14) What level of economic growth do we want?
15) What level of economic growth do we need?

Without conducting a public policy debate on these and other questions first, the population projections presented are a **fait acompli** and Texans and Houstonians are not being allowed a fair opportunity to voice what they want.

These population projections also do not take into account how growth trends can alter what the projections say. For instance the trend (and policy issue) of moving into rural areas is not reflected in the population projections in several counties that are outer-lying to Harris County (Trinity County being an example). The trend (and policy issue) of companies moving out of the more urban or populated areas and taking jobs with them to more rural areas is also not addressed in the population projections. Do we want to encourage these trends or not? Why are we not debating these public policy issues before projecting population? Texans and Houstonians are locked out of the process that determines growth, population growth, and growth in water use.

It seems obvious that the long planning time frame for water projects will cause projects to be built on speculation. This speculation in population growth and water use will then become fact. The fact that there are existing inter-basin water transfers between the San Jacinto, Brazos, and Trinity Rivers does not mean that this strategy should continue. It is the HSC contention that when a population seeks water outside of the watershed it lives in then it has already exceeded the carrying capacity of that watershed and that population is already greater than it should be.

The HSC objects to RHWPG seeking legislative approval to eliminate junior water rights. Why should profligate water users and population attractors take the water rights from others because they have not taken the responsibility to reduce their water use or population to fit the water they have that can be used? The HSC believes seeking the elimination of junior water rights in Region H is the start of the unraveling of this issue throughout Texas. The powerful haves will ensure that those who are not as powerful will suffer and must be burdened with the responsibility that the haves do not wish to carry. This is not fair or right.

The human population carrying capacity of each river basin needs to be determined, taking into account protecting sensitive areas and ecosystem needs, and then we need to plan so we do not exceed this population projection. This should be the goal of every water plan. We need a steady-state economy.

We need a full, public, debate to ensure that we get it right. By getting it wrong we ensure that we will degrade the environment that we rely on for all of our needs which means we will degrade our quality of life and reduce the carrying capacity for humans and especially for those who live after us. We reduce their options as we mandate water use now. We bring ourselves closer to ecological overshoot or collapse by not recognizing that humans are animals too and we are dependent on the same ecological principles as every other living organism. We cannot avoid the bullet.

On page 2-1, 2.1.2 Background; page 2-6, 2.2.2.1 Population Projection Methodology, paragraph 1; page 2-10, 2.2.2.3 Manufacturing Water Demand Projection Methodology; page 2-12, 2.2.2.6 Mining Water Demand Projection Methodology; page 2-12, 2.2.2.7, Livestock Water Demand Projection Methodology; page 2-20, Demand of Wholesale Water Providers; the HSC requests an explanation for the use of a 60 year planning period (2000 to 2060) when a 50 year planning period (2000 to 2050) is used by the TWDB. Since it will be four years since 2001 Region H water plan was approved, in 2005, one would think the year 2055 should be used if the planning period is a rolling one. The question needs to be asked: Do Texans and Houstonians want 45 million and almost 11 million people, respectively?

The Houston area is above its carrying capacity. This is reflected individually and cumulatively by the following:

1) For air quality, the Houston area exceeds the ozone National Ambient Air Quality Standard
2) For water quality, many bayous and other streams exceed their water quality standards
3) For water absorption capacity, major floods occur every year
4) For transportation, congestion is found on most major roads
5) For groundwater capacity, there are falling groundwater levels in many places, activated faults, and subsidence
6) For surface water capacity, overuse of surface water has led to importation of surface water across river basins
7) For protected park and ecological lands, Houston is far below standards for park acreage/1,000 people
8) For farmland, farmland use and acreage is decreasing in most counties
9) For quiet, noise barriers are being erected on many highways
10) For wildlife habitat, wetlands acreage is decreasing

When will the RHWPG and the TWDB address the problem of exceeding its carrying capacity?

On page 2-4, 2.2.1 General, first paragraph, what are these "consensus-based estimates" for population projections? Have Texans and Houstonians been asked what population they want for themselves and their children's futures? Consensus by whom? Consensus for whom? Consensus for what purposes? Consensus for what goals? The RHWPG needs to be specific about who specifically has provided input and who agrees with these population projections.

On page 2-7, b) County Population Projections, first paragraph, it says that "Texans are substantially concentrated in single-race groups". A better word for this condition is "segregated".

On page 2-7, b) County Population Projections, second paragraph, it states that institutional populations "are assumed not to participate in the same demographic processes as the base population". The HSC disagrees with this statement. Certainly college/university, military, and prison populations result in births. The assumption that such populations are not involved with the same demographic processes and may not grow or decline is not correct. This part of the methodology needs to be reassessed and or reworded.

On page 2-8, c) Sub-County Population Projections, it states that "It is then assumed that the area's share of the county[s population growth will be the same in the future as it was between 1990 and 2000." What documentation exists to support this assumption? How is "maximum growth potential" defined? Where

has it been reached in Region H? What population and density is represented by this?

On page 2-9, 2.2.2.2 Municipal Water Demand Projection Methodology, a) Per Capita Water Use, simply dividing the total annual reported municipal water used by total estimated population is a gross over simplification of per capita water use. This figure lumps in inefficiency of water use (major leaks in the system) and charges this to individuals when these are system problems that are more likely to be addressed if addressed separately. RHWPG should calculate major water leaks as separate from individual uses so that the major water leaks can be more easily addressed and reduced.

On page 2-13, County-Level Population, Criteria, it is not clear how illegal immigration is taken into account. How is this addressed as accurately as possible?

On page 2-14, Sub-County Population, Criteria, a), how is "substantially greater than the growth rate between 1990 and 2000" defined?

On page 2-14, Sub-County Population, Criteria, d), where has RHWPG found "growth limitations or build-out conditions in a city or utility that would result in maximum population that is less than was originally projected"? Discussion of these areas and why they operate differently than other areas so we have insight into whether we want to emulate this more with respect to water use.

On page 2-18, Municipal Water Demand; page 2-19, Irrigation Water Demand; page 2-19, Steam-Electric Power Generation Water Demand; page 2-19, Mining Water Demand; page 2-19, Livestock Water Demand the RHWPG must explain specifically how the latest baseline population projections and per capita water use estimates for 2000 resulted in a 5% decrease and in 2050 a 5% increase for municipal water demand; resulted in a 36.17% increase over TWDB projections for 2060 for irrigation water demand; resulted in a 12.5% decrease for 2001 and a 74% increase in 2006 for steam-electric power generation demand; resulted in a 46% increase in 2001 and 97% increase in 2006 for mining water demand; resulted in a 6% decrease from 2000 to 2060 for livestock water demand. How accurate are these demand figures? What assumptions or calculations changed? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these water demand figures.

On page 2-20, Austin; page 2-21, Brazoria, Chambers, and Fort Bend; page 2-22, Galveston and Harris; page 2-23, Leon Liberty, and Madison; page 2-24, Montgomery and Polk; page 2-25, San Jacinto, Trinity, and Walker; and page 2-26, Waller; this document says, "The decrease in municipal water demand is a result of more accurate baseline population projections and per capita water use estimates". Explain specifically, for each county, how the

baseline population projections and per capita water use estimates are more accurate and why they have changed. The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

In all of Chapter 2, for population projections, water demands, and associated figures, the HSC recommends that the RHWPG explain specifically why changes occur when these changes entail increases or decreases of 10% or more from previous calculations, assumptions, estimates, and projections. The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-20, Austin, specifically, why has population increased 52% over the 60 year planning period? Specifically, why has municipal water demand decreased 14% in 2050? Specifically, why has livestock and irrigation water demands decreased by 19% and 14%, respectively? Specifically why has mining water demand increased by over 100% during the 60 year planning period? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-21, Brazoria, specifically, why are mining demands predicted to increase over the 60-year planning period? Specifically, why have livestock and irrigation demands increased by 51% and 14%, respectively? Specifically, why has population increased 108% over the 60 year planning period? Specifically, why has 2001 and 2006 municipal water demand increased 16% and 16.5%, respectively? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-21, Chambers, specifically, why are manufacturing and mining demands, when compared to 2001, expected to increase by nearly "156 and 528 percent in the 2050 decade, respectively? Specifically, why has population increased 102% over the 60 year planning period? Specifically, why has 2050 municipal water demand increased 17%? Specifically, why has livestock water demand projections decreased 40%? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-22, Fort Bend, specifically, why has overall water demand increased by nearly 58% in the 2050 decade, between the 2001 and 2006 plans? Specifically, why has population increased 242%? Specifically, why has municipal water demand decreased 10% in 2050 in the 2006 regional water plan (RWP)? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-22, Galveston, specifically, why has population increased 21% over the 60 year planning period? Specifically, why has municipal water demand

decreased 25% in 2050 in the 2006 RWP? Specifically, why has livestock water demand increased by 127%? Specifically, why has manufacturing demand increased 57% over the 60 year planning period? Specifically, why has mining and steam-electric power generation demand increased by 580% and 335% in 2050? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-22, Harris, specifically, why has population increased 97%? Specifically why has manufacturing demand increased by 37% over the 60 year planning period? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-23, Leon, specifically, why has population increased 50%? Specifically, why have municipal water demands increased 19% and 23% for 2000 and 2050, respectively? Specifically, why have manufacturing demand projections increased over the 60 year planning period by more than 100%? Specifically, why have manufacturing projections increased by 200% and 519% for 2000 and 2050, respectively? Specifically, why has mining demands decreased by 20% over the 60 year planning period? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-23, Liberty, specifically, why has population increased 110% over the 60 year planning period? Specifically, why has municipal water demand decreased 21% in 2050 in the 2006 RWP? Specifically, why has livestock demand increased 75% in the 2006 RHP? Specifically, why has manufacturing demand increased 150% over the 60 year planning period? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On pages 2-23-2-24, Madison, specifically, why has population increased 36% over the 60 year planning period? Specifically, why has municipal water demand decreased 37% and 11% in 2000 and 2050 in the RWP? Specifically, why has livestock and irrigation demand increased by 46% and 62% in the 2001 and 2006 RWP? Specifically, why has manufacturing demand increased 162% and 270%, respectively, for 2000 and 2050 in the RWP? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-24, Montgomery, specifically, why has population increased 353% over the 60 year planning period? Specifically why has municipal demand increased 11% and 25% for 2000 and 2050 in the RWP? Specifically why has livestock and irrigation demand increased by 21% and 230%? Specifically, why has mining demand increased 38% and steam-electric power generation demand 560% in the 60 year planning period in the 2006 RWP? The RHWPG must

provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-24, Polk, specifically, why has population increased 64% over the 60 year planning period? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-25, San Jacinto, specifically, why has population increased 86% over the 60 year planning period? Specifically, why has livestock demand increased 67% in the 60 year planning period in the 2006 RWP? Specifically, why has manufacturing demand nearly doubled between 2001 and 2006 RWP? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On page 2-25, Trinity, specifically, why has municipal demand decreased 33% and 34% in 2000 and 2050 in the 2006RWP? Specifically, why has irrigation demand increased from 4 to 467 acre feet/year?

On pages 2-25-2-26, Walker, specifically, why has population increased 31% over the 60 year planning period? Specifically, why has municipal demand increased 40% and 33% in 2000 and 2050 in 2006 RWP? Specifically, why has livestock demand increased from 565 to 632 acre feet/year? Specifically, why has manufacturing demand increased 1000% and 1,500% in 2000 and 2050 in the 2006 RWP? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On pages 2-26, Waller, specifically, why has population increased 226% over the 60 year planning period? Specifically, why has municipal demand decreased 28% and 49% in 2000 and 2050 in the 2006 RWP? Specifically why has livestock demand decreased from 1,238 to 939 acre feet/year? Specifically, why has irrigation demand decreased from 28,405 to 22,978 acre feet/year? Specifically why has manufacturing demand increased 50%? The RHWPG must provide this information so that the public can review, comment, and understand the basis for these changes.

On pages 2-52-2-66, Table 2-4, for Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Leon, Liberty, Madison, Montgomery, Polk, San Jacinto, Trinity, Walker, and Waller Counties, percent changes of 10% or greater must be explained. In Table 2-4, there are, for Austin County, 22; for Brazoria County, 24; for Chambers County, 26; for Fort Bend County, 24; for Galveston County, 27; for Harris County, 19; for Leon County, 22; for Liberty County, 27; for Madison County, 30; for Montgomery County, 32; for Polk County, 5; for San Jacinto County, 19; for Trinity County, 24; for Walker County, 35; and for Waller County, 30; changes that are equal to or greater than 10%. All of these changes must be explained so that the public can review, comment, and understand the basis for these changes.

On page 2-57, Table 2-4, another concern about percent change is found with Harris County municipal demand figures. While all percent changes are below 10%, the demand numbers are so large that any error in percent change would be significant to as low as 5%. Therefore the RHWPG should carefully examine the Harris County percent change figures to ensure their accuracy and provide this information so that the public can review, comment, and understand the basis for these changes.

With regard to the TWDB's Guidelines and Data Requirements for Addressing Revisions of the Consensus-Based Population and Water Demand Projections, the HSC questions whether residential and commercial water use should be combined together into municipal water use. The ways to approach reducing both of these water uses are different and cannot be considered best together and the growth trends can also be different. For instance, many individuals will reduce water use based on what this means for their family in the future or economics. Commercial water users will reduce water use based mostly on economics. Altruism plays a smaller role in what motivates these people when a water use education program is created.

In the TWDB guidelines another criteria that should be used is that the construction of larger water systems attracts more population growth and water use than smaller systems. That is because the bigger systems have more excess water capacity and water which can accommodate more growth. Such systems should not be given points because they can serve more people. The focus should be on systems that do not have excess capacity and provide room for more excess growth. Otherwise you feed the growth machine and defeat your ability to get ahead of population growth and provide capacity for severe droughts.

The HSC is concerned that the **"recommended most likely scenario"** will be used as the **"primary basis for planning".** This ensures that a policy debate does not occur and the real policy is based on the population projections that have not been truth-tested by public debate on what population growth Texans want. For instance, the Forecasting Methodology and Key Planning Assumptions, are based on fertility rates, survival rates, and migrations which all can be altered. Texans and Houstonians need to decide what we want within each of these three categories and then plan how we will achieve these goals. The so-called key assumptions are based on a policy decision to do nothing and accept whatever growth occurs that is induced by other policies of the State of Texas. What is the point of planning if this is all we are going to do?

The HSC does not agree with the assumption that **"power generation demands will grow in direct proportion to population growth."** This one assumption ignores the importance of energy conservation and reductions in waste and increases in energy efficiencies.

The HSC is particularly concerned about the impacts that these population projections and associated water use will have on Sam Houston National Forest and other sensitive ecological and wildlife areas. The HSC is concerned that shallow-water aquifers will dry up and that unique, seep, spring, moisture-loving, and stream-based plant and animal communities will suffer or be destroyed. The HSC is concerned that groundwater recharge areas will be paved over or be contaminated.

There is no recognition in these population projections about what they will mean, in terms of impacts, to Sam Houston National Forest and other private and public protected or ecologically sensitive areas. Without giving Texans and Houstonians this information how can they agree or disagree with any population projections.

The HSC requests that the population projections be withdrawn and that the public policy issues of population growth and economic growth, including the loss of natural landscapes and the altering of sensitive ecological areas be debated and decided first before making population projections and then building water projects to meet these projections. The concerns in this letter need to be answered. The HSC does not accept population projections that will irretrievably and irreversibly alter the natural resources that we depend on for survival and that these population projections are beneficial to Texans and Houstonians.

As one alternative to the present water use, population, and economic growth system, the HSC includes the article, "The steady state economy - What it is, entails, and connotes" as written by Mr. Brian Czech and Mr. Herman E. Daly. This document notes how the present system of economic growth affects wildlife and wildlife habitat and how a different system could begin to be implemented that would protect natural resources while supplying human needs. The HSC urges the RHWPG and TWDB to thoroughly review, understand, debate, and act on this problem.

Chapter 6, Water Conservation and Drought Management Recommendations

These comments are supplemental to those that Mr. Ken Kramer, Executive Director of the Lone Star Chapter of the Sierra Club, will submit on water conservation.

On pages 6-1 through 6-9, the HSC realizes that for municipal uses by public water suppliers, industrial or mining, agriculture, and wholesale water providers that, as Chapter 6 states, "The goals established by wholesale water suppliers under this subparagraph are not enforceable." However, the HSC is concerned that this statement will make water conservation implementation less urgent by water users. The HSC urges the RHWPG and the TWDB create as many

incentives and disincentives as possible to ensure that water conservation measures, BMP's, are implemented maximally. If these incentives and disincentives are not sufficient then RHWPG and TWDB should determine what measures are needed for mandatory enforcement of water conservation and push for implementation of these measures.

On page 6-10, 6.2 Drought Contingency Plan, the document says "The commission and the board by join rule shall identify quantified target goals for drought contingency plans ... Goals established under this subsection are not enforceable requirements." What are the quantified target goals for drought contingency plans? As we stated above for water conservation, the HSC is concerned that this statement will make meaningful drought contingency implementation less urgent. The HSC urges the RHWPG and the TWDB create as many incentives and disincentives as possible to ensure that drought contingency plans are implemented maximally and meaningfully. If these incentives and disincentives are not sufficient then RHWPG and TWDB should determine what measures are needed for mandatory enforcement of meaningful drought contingency plans and push for its implementation of these measures.

Region H Water Management Strategy Analysis Technical Memorandum

The HSC has several concerns about this document. Of the 165 conservation surveys sent out 47 or 28.48% were returned. This figure is low. Whatever Region H can do about increasing the rate of return would be very helpful in determining implementation of water conservation measures.

There is no reason provided why the water user groups (WUG's) were divided into three different groups. The public must be provided this information so that it can review, comment, and understand the basis for this division.

On Table 1, from the 28.48% of total replies that were received it is evident that very few water conservation strategies are being implemented. Only two of the strategies are being implemented in at least 50% of the entities surveyed. It is crucial that Region H work hard to encourage and where it can require that water conservation strategies be implemented maximally. If this occurs then not only will we be able to better live within our means but we will have more water for instream flows and bays and estuaries and other ecological requirements and we will reduce the cost of water use considerably.

In particular, water conservation pricing, by which the HSC means increasing block rates, will create a great deal of incentive to reduce water use. Our society emphasizes money more than any other value. Therefore pocketbook costs and savings are real incentives for water conservation and increasing block rates can do this quicker and more thoroughly than other options. The HSC very much

disagrees with Region H when it says that water conservation pricing is "too WUG specific for regional planning purposes and therefore not considered as part of this conservation management strategy." It makes no sense to take the very best and most effective water conservation strategy off the board before you even begin to implement water conservation. The same comments also apply for water reuse and prohibition on wasting water.

The list of water conservation best management practices (BMP's) is too skimpy for all three population groups. In order to aggressively utilize and implement water conservation strategies Region H needs to require that as many as possible be considered, analyzed, and adopted as possible.

Another problem with the memorandum is that it gives little information about cost savings that result from reducing water usage and water infrastructure use and expansion. These are real benefits that need to be quantified and emphasized in the water plan and for water conservation plans that are submitted.

The HSC points out that water conservation does have environmental impacts. These impacts are beneficial and should be listed and their benefits described and dollar savings quantified.

We appreciate this opportunity to comment. Thank you.

Sincerely,

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In My Opinion: The steady state economy—what it is, entails, and connotes

Brian Czech and Herman E. Daly

In its technical review on economic growth, The Wildlife Society (TWS) described a "fundamental conflict between economic growth and wildlife conservation" (Trauger et al. 2003:2). This conflict exists because, as the economy grows, natural capital (such as timber, soil, and water) is reallocated from wildlife to the human economy (Figure 1). Many believe technological progress may reconcile this conflict, but technological progress expands the breadth of the human niche and, in the service of economic growth, exacerbates the conflict (Czech 2003).

Generally speaking, it is not possible to reconcile values subject to a fundamental conflict, although compromise sometimes is portrayed as reconciliation. Plenty of wildlife conservation has been compromised for the sake of economic growth, sometimes under the banner of "smart growth," and the compromising continues. Therefore, TWS is considering taking a position on economic growth (Table 1).

The position on economic growth was proposed by TWS's Working Group for the Steady State Economy on September 6, 2003 at the TWS annual conference in Burlington, Vermont. It is similar to a position adopted by the United States Society for Ecological Economics on August 3, 2003 but is more specific to wildlife conservation. The technical concepts are well established and largely incontrovertible, as evidenced by the TWS technical review on economic growth. However, some of the clauses in the position may be politically controversial. Perhaps the biggest controversy will stem from clause 5 in the "Therefore" list (Table 1.B), which states, "A steady state economy (that is, an economy with a relatively stable, mildly fluctuating product of population and per capita consumption) is a viable alternative to a growing economy and has become a more appropriate goal in the United States and other large, wealthy economies."

Several questions and concerns already have arisen about what this statement means and what it might imply or connote. The most prominent questions are:

1. What is a steady state economy in more detailed terms than "an economy with a relatively stable, mildly fluctuating product of population and per capita consumption"?
2. How is the quality of life affected by a steady state economy?
3. What happens to jobs in a steady state economy?
4. Will we lose our retirement accounts in a steady state economy?
5. Won't the stock market crash in a steady state economy?
6. Does a steady state economy require a socialist government?
7. How big should a steady state economy be?
8. Why is a steady state economy "a more appropriate goal in the United States and other large, wealthy economies"?

In this article we provide answers to these and related questions.

What is a steady state economy?

The most distinctive trait of a steady state economy is stable size (Daly 1997). A steady state economy undergoes neither growth nor recession. To be more specific, it has constant populations of people (and therefore "stocks" of labor) and constant stocks of capital. It also has a constant rate of

DECKER, E. 1986. Verbal presentations. Pages 829–840 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors. Inventory and monitoring of wildlife habitat. United States Department of Interior, Bureau of Land Management, Service Center. Denver, Colorado, USA.

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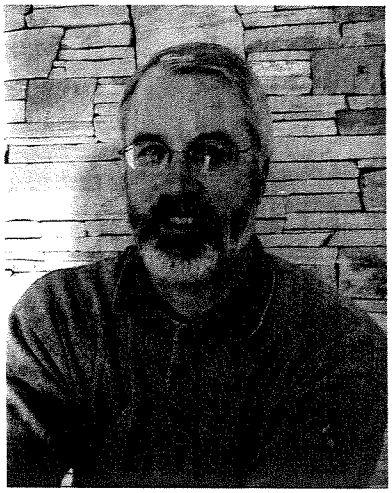

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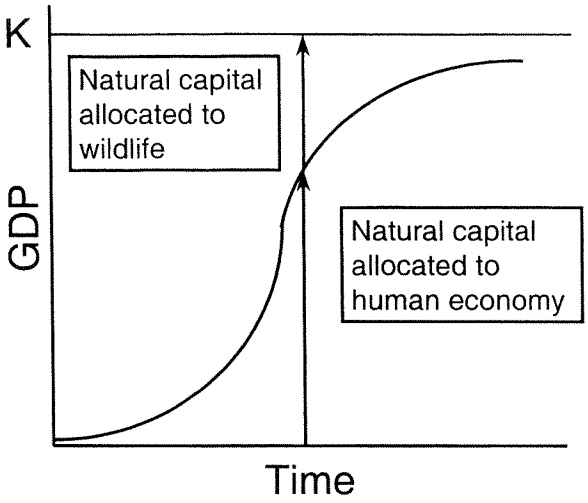

Figure 1. Natural capital (such as soil, water, and timber) reallocated from wildlife to humans in the process of economic growth (modified from Czech 2000*a*). As the economy grows, the natural capital comprising wildlife habitat (represented above the sigmoid curve) is liquidated and converted to goods and services in the human economy (represented below the sigmoid curve).

"throughput"—i.e., the energy and materials used to produce goods and services.

Within a given technological framework these constant stocks will yield constant flows of goods and services. Technological progress may yield a more efficient "digestion" of throughput, resulting in the production of more (or more highly valued) goods and services. However, there are limits to productive efficiency imposed by the laws of thermodynamics and therefore limits to the amount and value of goods and services that may be produced in a given ecosystem. In other words, consistent with the ecological principle of carrying capacity, often denoted as "K," there is a maximum size at which a steady state economy may exist. Conflicts with wildlife conservation occur long before a steady state economy is maximized (Figure 1).

By "constant" we do not mean absolutely unchanging at the finest level of measurement. We mean mildly fluctuating in the short run (which in political and economic terms may be defined as approximately a decade or less) but tending toward a stable equilibrium in the long run. Any long-run changes would reflect evolutionary, geological, or astronomical processes that alter the carrying capacity of the earth for the human economy. These processes generally operate too slowly to merit practical consideration by managers or politicians, though dramatic exceptions such as atmos-

Table 1. Draft of The Wildlife Society (TWS) position on economic growth proposed by Working Group for the Steady State Economy at TWS conference, 6 September 2003.

A. Whereas

1) Economic growth, as defined in standard economics textbooks, is an increase in the production and consumption of goods and services, and;

2) Economic growth occurs when there is an increase in the multiplied product of population and per capita consumption, and;

3) The American economy grows as an integrated whole consisting of agricultural, extractive, manufacturing, and services sectors that require physical inputs and produce wastes, and;

4) Economic growth is often and generally indicated by increasing real gross domestic product (GDP) or real gross national product (GNP), and;

5) Economic growth has been a primary, perennial goal of American society and government, and;

6) Based upon established principles of physics and ecology, there is a limit to economic growth, and;

7) There is increasing evidence that American economic growth is having negative effects on the long-term ecological and economic welfare of the United States and the world.

B. Therefore

1) There is a fundamental conflict between economic growth and wildlife conservation, and;

2) There is a fundamental conflict between economic growth and the ecological services underpinning the human economy (for example, pollination, decomposition, climate regulation), and;

3) Technological progress has had many positive and negative ecological and economic effects and may not be depended on to reconcile the conflict between economic growth and wildlife conservation in the United States and the world, and;

4) Economic growth, as gauged by increasing GDP, is an increasingly dangerous and anachronistic American goal, and;

5) A steady state economy (that is, an economy with a relatively stable, mildly fluctuating product of population and per capita consumption) is a viable alternative to a growing economy and has become a more appropriate goal in the United States and other large, wealthy economies, and;

6) The long-run sustainability of a steady state economy requires its establishment at a size small enough to avoid the breaching of reduced ecological and economic capacity during expected or unexpected supply shocks such as droughts and energy shortages, and;

7) A steady state economy does not preclude economic development, a qualitative process in which different technologies may be employed and the relative prominence of economic sectors may evolve, and;

8) Upon establishing a steady state economy, it would be advisable for the United States to assist other nations in moving from the goal of economic growth to the goal of a steady state economy, beginning with those nations currently enjoying adequate per capita consumption, and;

9) For many nations with widespread poverty, increasing per capita consumption (in some cases via economic growth and in other cases via more equitable distributions of wealth) remains an appropriate goal.

phere-altering volcanoes and massive meteorite collisions may occur.

The rationale for touting the steady state economy is that it (and wildlife populations) would be sustainable for a long time. In contrast, neither a growing economy nor a shrinking economy is sustainable in the long run. Because sustainability is the raison d'être for a steady state economy, at least one more criterion must be introduced. Namely, in a steady state economy pollutants are generated at a rate that does not exceed the assimilative capacity of the environment (Daly 1997). Pollutants that accumulate are a threat to ecological integrity and tend to reduce long-run economic carrying capacity.

How is the quality of life affected by a steady state economy?

A steady state economy is similar to a population of a K-selected animal species; it stabilizes at or slightly below carrying capacity (K). It avoids the fate of the r-selected species that exceeds K and crashes, damaging its environment in the process and compromising the prospects of its progeny. However, wildlife biologists know that a wide variety of social structures may produce stable populations. The same holds true for a steady state economy. For example, a steady state economy with long human life spans entails low birth and death rates. In our opinion this is preferable, within reason, to a steady state economy with short life spans, high birth rates, and high death rates. The same concept applies to capital and durable goods such as automobiles. We opine that a relatively slow flow of high-quality, long-lasting goods is preferable to a fast flow of low-quality, short-lived goods.

Nothing about a steady state economy precludes economic development, where development is defined as a qualitative process. Various sectors may come and go in a steady state economy. For example, organic farms may supplant factory farms, the proportion of bicycles to Humvees may increase, and professional soccer may attract more fans while NASCAR attracts fewer. As long as the physical size of the economy remains constant in the long run, a developing economy is a steady state economy.

Nor would any type of cultural stagnation result from a steady state economy. John Stuart Mill (1806–1873), one of the greatest economists and political philosophers in history, emphasized that an economy in which physical growth was no longer the goal would be more conducive to political, ethical, and spiritual improvements (Mill 1900). Quality-of-life characteristics are a matter of preference, however, and have not been proposed for adoption by TWS (Table 1).

What happens to jobs in a steady state economy?

In economic discussions, a common qualifier is *ceteris paribus,* which means all else equal. *Ceteris paribus*, a steady state economy means a constant rate of employment. The "all else" remaining equal includes such factors as mean throughput per worker, salary, and retirement age. For example, a steady state economy may have higher rates of employment when throughput per worker, salary, and retirement ages are lower.

Ceteris paribus does not mean, however, that each particular job is retained in perpetuity. Economic development continues in a steady state economy so that in the extractive sector, oilfield roughnecks may decrease in number while windpower facility attendants may increase. In the arts, guitar playing may wax while flute playing wanes. In the sciences, industrial chemists may be replaced by wildlife ecologists.

Ceteris paribus, there is an optimum size of the economy for society as a whole. There is also an optimal size, perhaps smaller, from the perspective of the wildlife profession. Wildlife biologists are not in demand in primitive economies emerging from the wilderness. As an economy grows, however, natural capital is liquidated, wildlife habitats are lost, and wildlife becomes scarce (Figure 1). Society begins devoting fiscal resources to conserving and managing wildlife, and the wildlife profession thrives. As vast areas become devoid of desirable wildlife, however, there are fewer reasons to hire biologists.

Has the optimum size of the economy for the wildlife profession (and those many citizens who value wildlife highly) been exceeded in the United States? Several trends suggest it has or is close to doing so. For example, as the American economy has grown more service-oriented and its population more urbanized, urban areas have usurped manageable wildlife habitats and the relative prominence of hunters (a major constituency for the wildlife profession) has declined. In the federal natural resources agencies, the wildlife profession has not kept pace with the engineering, forestry, and

recreational professions (Clarke and McCool 1996). And, of special interest to us, TWS membership has been declining while other professional societies have grown with the economy. A steady state economy would help stabilize the wildlife profession because it would fix the ratio of natural capital allocated to wildlife and humans (Figure 1).

Will we lose our retirement accounts in a steady state economy?

For that matter, what happens to bank accounts in general? Answering this question in the context of ecological economics requires us to briefly consider the origins of monetary income. Income reflects the use of natural resources and therefore the loss or conversion of wildlife habitats. This relationship of income to natural resource use is most readily observed in agricultural and extractive industries. However, as pointed out by the physiocrats (predecessors of the classical economists), the origins of all monetary income are in agricultural surplus (Heilbroner 1992). Without agricultural surplus, everyone is too busy acquiring food (hunting, gathering, or subsistence farming) to specialize in the production of other goods (much less "higher" services such as entertainment) for wages. In other words, everyone's income and expenditure, no matter the sector they work in, depend upon the use of natural resources and therefore wildlife habitat loss. Wildlife biologists tend to recognize this process readily because of their training in trophic theory, which describes the consumers in the economy of nature as dependent upon the producers (plants) for their livelihood (Czech 2000*b*).

In ecological economics, we often elaborate upon this discussion of natural resources and income by introducing the term "natural capital" (Daly and Farley 2003:17) and adopting the definition of "income" developed by the Nobel Prize-winning economist Sir John Hicks (1904–1989) (Hicks 1948:172). Natural capital is the stock of natural resources (e.g., a forest) that yields a renewable flow of goods (e.g., perches for birds, timber for humans). Income, in the Hicksian sense, is the maximum one may consume over some time period and still leave productive capacity, or natural capital, intact. If the amount consumed during that time is equal to the growth of the capital stock, then the productive stock remains constant and can produce the same increment over the next time period. If the amount consumed is greater than the growth of capital stock, capital is liquidated and future productive capacity is lowered. The cardinal sin of accounting is to count the liquidation of capital as income, yet our national income accounting (i.e., the process of calculating GDP and GNP) routinely adds the money derived from the liquidation of natural capital.

In a steady state economy, the average amount of money in real dollars earned by workers from the current generation to the next remains constant. "Real dollars" means that inflation has been accounted for. Because income reflects the use of natural resources, stabilized income reflects a stabilized "ecological footprint," which is the area of land required to support a human being (Wackernagel and Rees 1996). In other words, stabilized income is Hicksian income.

If the steady state economy is established at a relatively low population level, the potential exists for each worker, and his replacement in the next generation, to earn a high income. This scenario is similar to that of a low-density deer (*Odocoileus* spp.) population with plenty of forage per deer. If, on the other hand, the steady state economy is established at a high population level, less income is available for the average worker, as in a high-density deer population with little forage per deer.

We think it important that a steady state economy be established at a relatively low population level. This scenario is conducive to incomes high enough to allow retirement savings and social security (in the generic sense), making the economy more politically acceptable and therefore more stable. If the steady state economy is established within ecological carrying capacity, each new generation may expect its workers to accumulate retirement savings of the same magnitude as the previous generation. So we think it important to establish a steady state economy as soon as possible. As the population grows, it becomes less likely the steady state economy may be established whereby incomes are high enough to support reasonable periods of retirement.

Won't the stock market crash if a steady state economy is established?

This question follows naturally from the preceding section because Americans have grown accustomed to investing in stocks for retirement purposes. Many people view the stock market as predi-

cated on economic growth, so they wonder if a stock market could even exist in a steady state economy. It certainly could and probably would. In a steady state economy, firms still need to invest in capital—namely, at the same rate at which capital depreciates. Publicly traded stocks provide the social benefit of liquidity to investors and offer an efficient mechanism for the acquisition of investment capital.

Stock markets tend to expand and contract in concert (though often with lags) with gross domestic product (GDP), the dollar value of newly produced, final goods and services. There are winners and losers in bullish and bearish markets, though the winners tend to be more prominent in the former. The stock market in a steady state economy of stable GDP would be neither bullish nor bearish for extended periods. It, too, would have winners and losers, with perennial losers becoming insolvent and being replaced by more competent firms. But in a steady state economy the stock market would be less of a casino than in the growth economy.

Economic growth, on the other hand, is bound to cause an extensive and extended stock market crash because demands for capital eventually will exceed the productive capacity of the earth. Therefore, advocating a steady state economy is appropriate not only for purposes of wildlife conservation but also because it would reduce the volatility of the stock market.

There are, of course, alternatives to the stock market for purposes of financing capital investment. For example, capital may be financed by private banks, cooperatives, and governments. In fact, all of these institutions are active financiers throughout the world. The relative prominence of each in a given nation helps to describe that nation's history, ideology, and "political economy," which brings us to our next question—a very big one.

Doesn't a steady state economy require a socialist government?

More generally put, what kind of government is most conducive to a steady state economy? Might it be, for example, a capitalist democracy, a communist state, or a dictatorship? In theory, each is capable of producing or coexisting with a steady state economy, but we do not think any of these is particularly conducive. Each has exhibited far more concern with GDP growth than with other important endeavors, such as poverty alleviation and, of course, wildlife conservation.

We think the form of government most conducive to a steady state economy, in the context of twenty-first-century nation states, is a constitutional democracy somewhat more socialized than the current American version. "Socialist democracies," as the term is used in political science (Brown 1995), already exist in many nations, most notably such European nations as Sweden, Switzerland, and England. Economists more frequently call them "mixed economies." These are democratically operated governments in which the state plays a more prominent role in the economy than the American government plays in its economy. Although the phrase "socialist democracy" often is fondly employed by Marxists, few socialist democracies have communist governments.

In a typical socialist democracy, most of the factors of production (land, labor, and capital) are owned by private parties, not by the state. However, subsets of these factors are more efficiently or equitably managed in the public interest and are owned by the state. For example, people may own the land on which they live and various smaller parcels, but the larger forests, grasslands, mineral deposits, oil fields, and fisheries are owned by the state. The state also tends to own and operate facilities requiring enormous investments in manufactured capital, such as power plants, railroads, and airlines. Socialist democracies also tend to provide services deemed too important to be relegated to the private sector and its profit-maximizing motive, such as health care, education, and environment protection.

Some Americans recoil at the mere mention of "socialist" or "socialism." Their reactions demonstrate, in part, the lasting success of Cold War, anti-socialist teachings. As the preceding paragraph suggests, however, the "socialist" democracies differ from American "capitalist" democracy in degree more than substance. The United States has not had anything resembling a truly free-market, laissez-faire economy since the days of "Manifest Destiny" early in the nineteenth century. The American government, designed to represent and serve American society, owns some land, operates some power plants, and provides some health care. Meanwhile, the world has not had anything resembling a truly communist state, in which virtually nothing outside the household is held as private property, since the fall of the Soviet Union in 1991.

A closely related issue is central planning. For some, a national goal of a steady state economy connotes central planning and invokes the once-dreaded Soviet Politburo. However, the issue of central planning is also raised if we tout GDP growth in the range of 3–4%, which the American government typically does (via the Council of Economic Advisors, Federal Reserve, and Department of Commerce). In fact, setting goals for GDP growth more closely resembles the outdated Soviet model, which was perennially tooled to maximize growth (Collins 2000). No matter what the goal is (e.g., 0%, 3%, or 6%), certain macroeconomic policies of the federal government follow. These policies typically entail tax structures, subsidies, and banking regulations. To the extent that we call this "central planning," we should at least acknowledge that it already exists in the American system.

At the 2003 TWS conference, wildlife biologists were exhorted by a plenary speaker, Shane Mahoney, to uphold the "North American model" of wildlife conservation. The North American model is characterized by public lands; a mixture of federal, tribal, and state (or provincial) jurisdiction; and financing of wildlife management programs through public taxation and user fees (such as hunting licenses). These characteristics come hand in hand and have been adamantly touted by other leaders in the wildlife profession such as Jack Ward Thomas, Valerius Geist, and James Teer.

Nowhere is the North American model more prominent than in the United States. American federal, state, tribal, and county forests, rangelands, and refuges constitute some of the biggest and best wildlife conservation areas in the world. In other words, when it comes to wildlife, American citizens own most of the primary factor of production: the land. Various government agencies have the authority to manage this land for us and to manage wildlife directly. Through these agencies we also hire the labor and own much of the capital to manage that land. We as citizens, including our elected officials and civil servants, constitute American society. Frankly, the "socialist" components of the American domestic economy are epitomized by the wildlife profession.

We do not think it desirable that the United States socialize the factors of production in each and every sector. But even the most orthodox economists recognize the existence of public goods that cannot be allocated efficiently by markets because they are nonrival and nonexcludable (Jones 1998). Examples include national defense, the ozone layer, and wildlife conservation. For goods that are rival and excludable, the market is relatively efficient at allocating resources and reasonably fair at distributing goods and services. Guns, butter, and entertainment should not be provided by the government. When it comes to wildlife, however, let us continue to champion the North American model of wildlife conservation, "socialist" aspect and all. The wildlife profession cannot afford to melt at the feet of Cold War propaganda ghosts.

How big should a steady state economy be?

Wherever this question is asked, it generates discussion about the ultimate economic carrying capacity of the global ecosystem. Global capacity indeed is an important question and one of the foci of the ecological economics movement. However, for TWS purposes, we suggest a different question: How much wildlife should be conserved? Presumably many members of TWS would answer, "As much as possible of what is left." This gives us the answer to the original question because conserving as much as possible of the remaining wildlife requires the establishment of a steady state economy as soon as possible and as close to the current size as possible. In GDP terms this is an economy of approximately $10.6 trillion for the United States and $32 trillion for the world.

Some may assume that public lands will be sufficient for wildlife conservation and that the ongoing protection of these lands will result in the establishment of a steady state economy of the appropriate size. This is an unlikely outcome, however, as long as economic growth is a primary, perennial, and bipartisan goal. In the context of a public and polity that prioritize economic growth, the political boundaries and protective mandates of our public lands are continually contested (Czech 2002). For example, the drive for economic growth has resulted in an ongoing effort to open more portions of Arctic National Wildlife Refuge to oil exploration and extraction.

Another potential answer to the question of how big the steady state economy should be is, "However big society wants it to be." Once the economy reached that size, whatever wildlife was left would be available for the wildlife profession to manage. Even if this apathetic philosophy were

adopted, however, TWS would have a responsibility to educate society about the fundamental conflict between economic growth and wildlife conservation. Only with such education could society make an informed decision about how big it wanted the economy to be. In the absence of such leadership, the American public is perennially pelted with win–win rhetoric claiming that there is no conflict between economic growth and wildlife conservation (Czech et al. 2003).

Why is a steady state economy "a more appropriate goal in the United States and other large, wealthy economies"?

Conversely, why is a steady state economy not just as appropriate in small, poor economies such as Haiti, Uganda, or Nepal? What about small, wealthy economies such as Switzerland, or large, poor economies such as India? The answers are practical and ethical. Only a wealthier nation can afford, fiscally and politically, to settle into a steady state economy with a reasonable standard of living. Small, wealthy nations should be encouraged to establish steady state economies, too, but only a large nation has the self-sufficiency and defensibility to establish and maintain a steady state economy in the face of global economic forces and international political pressure. Large, wealthy steady state economies may eventually assist other nations in their own steady state transitions.

Exhortation

In the truest spirit of American patriotism, let us continue to espouse the North American model of wildlife conservation. In that model, men and women of all races and classes, not just the royalty of old or the corporate executives of today, are free to share in the bounty of the nation's wildlife. Let us realize and act upon the fact, however, that the political and administrative boundaries of the public's conservation estate will erode and collapse under the pressures of economic growth (Czech 2002). This is inevitable, given the fundamental conflict between economic growth and wildlife conservation (Trauger et al. 2003). There is no reconciling this conflict, though plenty of compromising may yet be done. If wildlife conservation is our goal, however, we have a problem (economic growth) and there is a solution (a steady state economy). Our North American model, our wildlife, and our profession depend on us to advocate the solution, as proposed by the Working Group for the Steady State Economy (Table 1).

This column represents an opinion of the authors and not necessarily of their employers.

Literature cited

Brown, M. B. 1995. Models in political economy: a guide to the arguments. Second edition. Penguin, New York, New York, USA.

Clarke, J. N., and D. C. McCool. 1996. Second edition. Staking out the terrain: power and performance among natural resource agencies. State University of New York, Albany, USA.

Collins, R. M. 2000. More: the political economy of growth in postwar America. Oxford University, Oxford, United Kingdom.

Czech, B. 2000*a*. Economic growth as the limiting factor for wildlife conservation. Wildlife Society Bulletin 28:4–14.

Czech, B. 2000*b*. Shoveling fuel for a runaway train: errant economists, shameful spenders, and a plan to stop them all. University of California, Berkeley, USA.

Czech, B. 2002. A transdisciplinary approach to conservation land acquisition. Conservation Biology 16:1488–1497.

Czech, B. 2003. Technological progress and biodiversity conservation: a dollar spent a dollar burned. Conservation Biology 17:1455–1457.

Czech, B., E. Allen, D. Batker, P. Beier, H. Daly, J. Erickson, P. Garrettson, V. Geist, J. Gowdy, L. Greenwalt, H. Hands, P. Krausman, P. Magee, C. Miller, K. Novak, G. Pullis, C. Robinson, J. Santa-Barbara, J. Teer, D. Trauger, and C. Willer. 2003. The iron triangle: why The Wildlife Society needs to take a position on economic growth. Wildlife Society Bulletin 31: 574–577.

Daly, H. E. 1997. Beyond growth: the economics of sustainable development. Beacon, Boston, Massachusetts, USA.

Daly, H. E., and J. Farley. 2003. Ecological economics: principles and applications. Island Press, Washington, D.C., USA.

Heilbroner, R. L. 1992. The worldly philosophers: the lives, times, and ideas of the great economic thinkers. Sixth edition. Simon and Schuster, New York, New York, USA.

Hicks, J. R. 1948. Value and capital. Second edition. Oxford University Press, New York, New York, USA.

Jones, C. I. 1998. Introduction to economic growth. W. W. Norton, New York, New York, USA.

Mill, J. S. 1900. Revised edition. Principles of political economy, with some of their applications to social philosophy. Colonial Press, New York, New York, USA.

Trauger, D. L., B. Czech, J. D. Erickson, P. R. Garrettson, B. J. Kernohan, C. A. Miller. 2003. The relationship of economic growth to wildlife conservation. Wildlife Society Technical Review 03-1. The Wildlife Society, Bethesda, Maryland, USA.

Wackernagel, M., and W. Rees. 1996. Our ecological footprint: reducing human impact on the earth. New Society, Gabriola Island, British Columbia, Canada.

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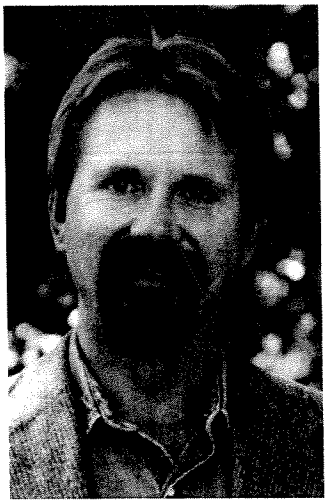

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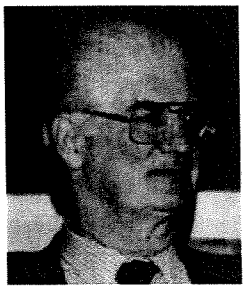
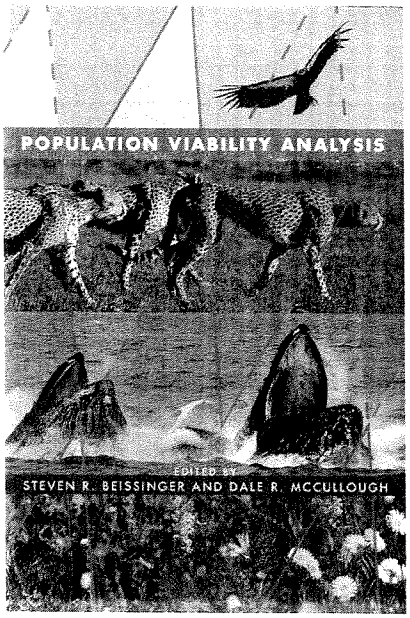


Herman Daly, Ph.D., (right) is professor, School of Public Affairs, University of Maryland, College Park, and former senior economist at the World Bank. He is a co-founder of the journal *Ecological Economics* and winner of several international awards, including the Grawemeyer Award for Ideas for Improving World Order. He is the author of several books, including *Steady-State Economics* and *Beyond Growth: the Economics of Sustainable Development*.

Book Reviews



Population Viability Analysis, by S. R. Beissinger and D. R. McCullough (editors). 2002. 496 pp. University of Chicago Press, Chicago, Illinois. $95 (hardcover), $35 (paper). A review by **Eric Rexstad**.

Population viability analysis (PVA) is a term that entered the lexicon of resource managers and biologists little more than 2 decades ago. It is now the title of a volume edited by Steven Beissinger and Dale McCullough from the University of California. This book consists of 25 contributions arranged in 3 sections: overview, issues of parameterization and construction, and integrating theory and practice. There are introductory comments for each section.

Readers of this journal will be interested in the content of the book, given that The Wildlife Society co-sponsored the symposium that led to its publication and assisted with production costs of the book. This topic has provoked sufficient interest that our sister organization, the Ecological Society of America, and *The Journal of Wildlife Management* have published reviews of this book.

Many of the book's contributions were presented at a conference held in spring 1999, but as the editors note, not all the papers presented are in the book and not all the papers in the book were presented at the conference. The editors were liberal in their choice of papers to include. Some contributions fall a bit far from PVA (e.g., the effective population size contribution by Waples, sensitivity analysis by Mills and Lindberg, and molecular genetics in conservation by Hedrick), but they provide a broader context into which to place PVA.

It takes some time for a tool to develop an identity, and one of the most interesting facets of this book is its effort to define PVA for theoreticians and practitioners. These definitions occur in the introductory chapter by Beissinger that endeavors to map the contents of the volume and also lay out some of the historical foundations and modern conundrums of PVA. The concluding chapter by Ralls et al. ambitiously attempts to establish guidelines for the use of PVA in endangered-species management. Those are the types of contributions that an edited volume can provide that would be difficult to find in journal articles.

Edited volumes possess strengths and weaknesses, and *Population Viability Analysis* is no exception. There is strength in the fact that a single topic is discussed from a variety of perspectives and approaches. One weakness is that although the symposium was held only 5 years ago and the book published just 2 years ago, the discipline has moved at such a rapid pace that some of the material is dated. For example, Paul Wade's paper (p. 234) noted the lack of Bayesian mark–recapture papers. This observation was true when written, but during the past 3 years several papers in that arena have been published.

The quality of the chapters is not universally consistent. Some chapters, particularly those addressing policy issues, are not of the same high quality as others in the volume. In summary, the book succeeds as an introduction to the methodology of

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JOINT VENTURE

January 21, 2005

Mr. Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, TX 77096

Re: **Response to Comments on Draft Chapters 1, 2, and 6 of the 2006 Region H Regional Water Plan**

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input to Draft Report Chapters 1, 2, and 6 for the 2006 Regional Water Plan. The following letter provides responses to the comments you provided in your letter dated December 14, 2004.

Comments to Chapter 1 – Description of Region

Comment 1 – Regional planning timeframe

The reference to the planning timeframe 2000-2050 in Chapter 1 refers to the planning horizon utilized during Senate Bill 1 Regional Water Planning and the 2001 Region H Regional Water Plan. The timeframe for Senate Bill 2 Regional Water Planning is in accordance with the TWDB Exhibit B – Guidelines for Regional Water Plan Development. Exhibit B Section 1.2.5 – Data Time Frame and Time Steps requires that the regional water plans be submitted to the TWDB using the year 2000 as the current year and decades 2010, 2020, 2030, 2040, 2050, and 2060 for planning purposes. **No changes are recommended to Chapter 1 in response to this comment.**

Comment 2 – Impacts on the use of saline aquifers due to carbon sequestration

Saline water use in the region is predominantly brackish surface water used for once-through cooling at power and industrial plants. The pilot carbon dioxide sequestration program being tested in Chambers County uses depleted oil and gas wells as the injection strata. Water from these levels is not typically used for water supply because of the need to remove hydrocarbons as well as salt before use. TCEQ and Texas Railroad Commission rules both prohibit the injection of wastes into drinking-water producing strata. **No changes are recommended to Chapter 1 in response to this comment.**

Comment 3 – Major springs

The statement in Chapter 1 indicating that there are no major springs in Region H is in relationship to surface water supply sources for Region H. There are no major springs in Region H utilized as a water supply source. Potential environmental impacts associated with shallow aquifers, recharge areas, etc. will be evaluated for each water management strategy selected to meet projected water supply shortages in Region H. **Additional clarification will be added to Chapter 1 in response to this comment.**

Comment 4 – Sam Rayburn Contract

The Sam Rayburn Contract refers to water supply from Sam Rayburn Reservoir that is currently contracted by WUGs in Region H from the Lower Neches Valley Authority (LNVA). These contracts rely on water stored in Sam Rayburn Reservoir to supply irrigation demands in Liberty County and to supply municipal use for the Bolivar Peninsular SUD in Galveston County. **Clarifying modifications will be made to Table 1-9 in response to this comment.**

Comment 5 – Chambers-Liberty Counties Navigation District (CLCND) change of use

Section 1.4.4, Major Water Providers, summarizes the currently permitted volumes of water supply for each major water provider in the region. The water rights for CLCND are currently used primarily to meet irrigation demands. The CLCND has a pending application to amend their permit use from irrigation to multiple (irrigation, municipal and manufacturing). This application is discussed in Chapter 4 of the report as a future management strategy. **No changes are recommended to Chapter 1 in response to this comment.**

Comment 6 – Definition of 100% reliable

Firm or 100% reliable water is defined for purposes of Regional Water Planning as the minimum amount of water that can the diverted annually from either a reservoir or run-of-river source given appropriate estimates and assumptions for return flows, sedimentation, and the utilization of permitted water rights in the basin. In general, the TCEQ WAM Run 3 was utilized to estimate firm yields for surface water supplies in Region H. **A clarifying sentence will be added to Section 1.4.4 in the report.**

Comment 7 – Lower Brazos River dioxin in sediments

The Texas Department of Health lifted this health advisory in 1997, following a site clean-up and retesting conducted in 1996. All water quality data comes from the TCEQ Water Quality Inventory, which is conducted biennially. **No changes are recommended to Chapter 1 in response to this comment.**

Comment 8 – Water conservation for all users

The discussions in Section 1.6.1 of Chapter 1 are in reference to how conservation was handled in the last round of planning. Water conservation strategies will be recommended for municipal, irrigation, and industrial demands for the 2006 Region H Regional Water Plan. **No changes are recommended to Chapter 1 in response to this comment.**

Comment 9 – Accommodation of growth

Regional Water Plans must be developed in accordance with the Planning Guidelines specified by the TWDB. The guidelines require that projected water shortages for each water user group (WUG) in the region be addressed through the identification of water management strategies including water conservation to eliminate the shortage. The guidelines do not provide for the ability to recommend that shortages and projected growth not be met in the region. A water management strategy must be developed for all WUG shortages. The cost and environmental impacts associated with recommended water management strategies must also be addressed in the plan.

Changes in the water planning process and technical guidelines would need to be recommended to the Texas Water Development Board or to the Texas Legislature. At present, the Regional Water Planning Group must address water shortages and must accommodate projected growth in the Regional Water Plan. **No changes are recommended to Chapter 1 in response to this comment.**

Comment 10 – Notification procedures for Regional Plan amendments

A revision to the notification procedures for Regional Plan amendments was recommended in the 2001 Region H Regional Water Plan. As worded, this recommendation would have reduced the notification requirement for the groundwater portion of the recent plan amendments, but not the portion recommending new water rights. While the Region H Planning Group has made a similar recommendation to the TWDB during this planning cycle, it is not known at this time if a similar recommendation will be included as a Regulatory and Administrative recommendation for the 2006 Region H Regional Water Plan. **Policy recommendations for the 2006 Region H Regional Water Plan will be discussed at future public Region H meetings and the Houston Sierra Club will have the opportunity to make additional public comments on this issue at that time.**

Comment 11 – Interbasin transfers

A revision to the current Interbasin Transfer requirements (Senate Bill 1 Junior Water Rights) was recommended in the 2001 Region H Regional Water Plan. It is not known at this time if a similar recommendation will be included as a Legislative recommendation for the 2006 Region H Regional Water Plan. **Policy recommendations for the 2006 Region H Regional Water Plan will be discussed at future public Region H meetings and the Houston Sierra Club will have the opportunity to make additional public comments on this issue at that time.**

Comments to Chapter 2 – Presentation of Population and Water Demand

The Region H Regional Water Planning Group Consultant Team submits the following summary and description of the process used during the development of population and water demands for the region. Responses to specific comments to Chapter 2 are provided following this discussion. Details of the methodology used to estimate population projections for the region are provided in Draft Chapter 2 and also in TWDB Exhibit B referenced earlier in this letter.

In general, the TWDB developed draft estimates of population projections for each WUG in the region using a cohort-component procedure. The cohort-component procedure uses separate cohorts such as age, sex, race, ethnic group, and components of change such as fertility rates, survival rates, and migration rates to calculate future WUG populations. The 1990 and 2000 census data was used to develop estimates of growth between these decades and, in general, these growth rates were then used to project population estimates for subsequent planning decades. The TWDB provided the draft population projection estimates to the Region H Planning Group for review and approval. The Region H Planning Group sent a letter to each WUG in the region summarizing the TWDB draft projections for the individual WUG and requested comments regarding the draft estimates. Based on these comments and comments received from non-municipal interests (i.e., irrigation, manufacturing, etc.), the Region H Planning Group recommended revisions to the population estimates. This process took place and was discussed at several Region H public meetings prior to the population numbers being adopted by the Region H Planning Group.

Likewise, estimates for projected water demand were also developed by the TWDB and submitted to the Region H Planning Group in draft for review and approval. The TWDB used data from the 2000 water use survey to develop estimates of per capita water usage for municipal WUGs in the region. The year 2000 was selected because 1) it coincided with the 2000 census data, 2) it was the driest year in the last decade for a majority of the region according to the Palmer Drought Severity Index, and 3) the year 2000 water use data takes in to account water use savings that have resulted from the 1991 State Water-Efficiency Plumbing Act or conservation programs supported by the WUG. In addition, the base year 2000 per capita water use estimates were adjusted (reduced) over each planning decade to account for additional water savings projected as a result of the 1991 State Water-Efficiency Plumbing Act. The estimated per capita water uses were then applied to the projected WUG populations to develop projected total water demands for each WUG over the planning cycle.

The TWDB also developed draft water demand projections for non-municipal WUGs using 2000 water use data and additional data developed by TWDB consultants and cooperative agencies including Waterstone Environmental Hydrology and Engineering, Inc., the Perryman Group, Natural Resource Conservation Service, Texas Agricultural Statistics Service, Texas A&M Agricultural Extension Service, and other state and federal agencies. The TWDB submitted draft estimates of water demand projections for all municipal and non-municipal WUGs to the Region H Planning Group for review and approval. The Region H Planning Group sent a letter to each WUG in the region summarizing the TWDB draft water demand projections for the individual WUG and requested comments regarding the draft estimates. Based on these comments and comments received from non-municipal interests (i.e., irrigation, manufacturing, etc.), the Region H Planning Group recommended revisions to the water demand estimates. Similarly to population estimates, this process took place and was discussed at several Region H public meetings prior to the water demand numbers being adopted by the Region H Planning Group.

The planning process is well-defined in terms of what methodology will be used for regional water planning and what process needs to be followed to develop population and water demand projections. These methods and processes are well documented in the TWDB Exhibit B document and have also been discussed and summarized at several Region H public meetings. The Houston Sierra Club has commented on issues related to the validity of the process as a whole and has recommended that the process for developing population and water demand projections be dramatically revised from the current methodology. These comments and issues cannot be addressed by the Consultant Team during this current round of water planning for the 2006 Region Plan, nor by the Region H Water Planning Group. These comments should be directed to the State Legislature and the TWDB as recommended changes to the planning process.

Comment 1 – Explanation of 60-year planning cycle

See response to Comment 1. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 2 – Address carrying capacity of Houston area

Determining the "carrying capacity" of a region and implementing strategies to limit growth so as to stay within that capacity is not currently the specified planning method under this program. This question should be directed to the Texas Legislature. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 3 – Input and consensus for population projections

See initial discussion provided above for the methodology, process, and public input provided during the development of estimates for population projections for Region H. Population projections were developed following the above-described process and methodology. The question of "what population our region wants?" is not currently considered in the water planning guidelines. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 4 – reference of "single race groups" versus "segregation"

This comment appears to be editorial in nature and not a specific comment to be addressed by the Region H Planning Group. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 5 – Handling of institutional populations in the population projections for Region H

The reference to "institutional populations" in Chapter 2 is directly from the TWDB guidelines regarding population growth projections. This methodology was developed and applied throughout all regions in the State by the TWDB. The statement that "institutional populations", which are defined as colleges, universities, military, and prison populations do not participate in the same demographic processes as the base population is a reasonable assumption. While there are births associated with these populations, it is reasonable to assume that the same birth rates and migration attributes cannot be applied to these populations. Also note that while these populations are removed from the base population for computing future cohort populations, they are added back to the total population at the end of each projection interval. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 6 – Assumption that county population growth is the same as experienced between 1990 and 2000 for future decades and definition of "maximum growth potential" for the region

See initial discussion provided above for the methodology, process, and public input provided during the development of estimates for population projections for Region H and the response to Comment 2. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 7 – Water demand projections and per capita water use does not reflect major water system losses

The determination of water losses for major water leaks throughout Region H is not included in the approved scope of work. This would require the review and analysis of water system production and water sales records to determine estimates of water losses for every WUG and WWP in the region. While such effort is technically feasible, it is outside the limits of current funding and approved scope of work for regional planning. However, it should be noted that system water losses and water system audits are included as recommended municipal water conservation BMPs and therefore the estimated municipal demand water reductions as a result of implementing these BMPs are included as a management strategy for the region. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 8 – illegal immigration and the impact to population projections

The population projections are based on the 1990 and 2000 census data. Illegal immigrant populations would be identified only if these populations were included in the census. During the

review and public comment period for the proposed population and water demand numbers for Region H, no comment or information related to illegal immigration was received. The Planning Group must provide specific information to the TWDB in order to revise county-level population projections. Specifically on the subject of illegal immigration, the group would need to submit documentation of an action requesting the Census Bureau correct an undercount of population within a county. No such documentation was received and therefore no revisions to the population related to illegal immigration were recommended. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 9 – definition of "substantially greater than the growth rate between 1990 and 2000"

This statement refers to one of the criteria for revising sub-county population projections in which documentation is provided to support a growth rate for a WUG that is "substantially greater" than what the TWDB is projecting. There is no codified definition of "substantially greater" and therefore this criteria is left to the discretion of the planning groups. Each WUG in Region H was sent a letter informing them of their projected populations and water demands for review. Some WUGs provided the regional planning group information documenting a need to change their projections (either increase or decrease) from the TWDB base projections. Chapter 2 provides information for any WUG projections that were revised from the TWDB base projection. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 10 – growth limitations or build-out conditions in Region H which impact maximum population projections

WUGs who submitted documentation supporting an existing or near-term future build-out condition, which would limit future growth within the WUG, were considered during development of population and water demand projections. These WUG populations and associated water demands were adjusted based on this documentation, and the additional projected growth was reallocated to County-Other. These areas do not "operate differently than other areas", but instead represent municipalities and water districts with boundary constraints and no plans to annex additional land into their current service area who have reached or expect to reach their fully built-out condition before the end of the planning period. **No changes are recommended to Chapter 2 in response to this comment.**

Comments 11-29 – changes in projected water demands for WUGs in the region as compared to the 2001 Region H Regional Water Plan

The following is in response to Comments 11 through 29 which request specific information regarding changes (decreases and increases) in the population and water demand projections for municipal, irrigation, manufacturing, livestock, mining, and steam-electric power WUGs for this round of planning versus the 2001 Region H Regional Water Plan. These comments are being responded to as a whole as opposed to individually, as provided by the Sierra Club, due to the similarity in responses that would be generated for each county and the region as a whole for each different WUG classification.

In general, the data available and used in developing the current estimates of population and water demand projections for the proposed 2006 Regional Water Plan was not available during the development of the 2001 Regional Water Plan. Population projections were derived for the 2001 Regional Water Plan through a "consensus-based" approach in which the TWDB developed

projections using several different methods and assumptions and the individual regions reviewed the information and developed a consensus within each region for which projections were most reasonable. The 2006 Regional Plan is utilizing a standard cohort-component procedure using data from the 1990 and 2000 census.

Also, the TWDB 2000 water use survey was used as the basis of the water demand projections. Year 2000 had below-average rainfall throughout most of the state, enabling the TWDB to use actual dry-year usage data as the basis for future projections. The methodology for the 2001 Regional Water Plan used an estimate based on a range of rainfall conditions. This new data, coupled with its coincidence with the census year, makes this set of projections much more appropriate for the planning objectives.

Because the methodologies for projecting population and water demands differ between the 2001 and 2006 regional plans, the results are expected to differ and therefore resulting decreases and increases in population and water demands are also expected to occur. Regional water planning is an ongoing process and the population and water demand projections will continue to change with each successive planning cycle as new census information identifies changes in growth trends and as methodologies for developing projections are modified. The simple fact that results of new projections indicate changes from the last projections does not indicate a "problem" or "concern" with the projections. In fact, this change is expected and at some level is desirable because it indicates that the projections are being examined and adjustments are being made as additional data and refined methodologies are developed.

Specifically for municipal WUGs, the changes in projected population and water demands between the 2001 Regional Water Plan and the proposed 2006 Regional Water Plan are a function of more accurate baseline year 2000 census based population estimates and actual year 2000 water use rates. The 2006 RWP also subdivided portions of county-other into named WUGs, thus allowing more accurate and discrete water use projections. Furthermore, population projections from the 2001 RWP were developed using a consensus-based approach, which incorporated various projection methodologies. The TWDB used the 1990 census and 1998 State Data Center estimates to develop a population projection estimate for the year 2000. The year 2000 population projection estimates were then extrapolated to year 2050. Where feasible, the subsidence district estimates were also studied and used to develop population projections. In some cases, best available information was also used to develop the population projection estimates. Based on these methodologies, a "consensus-based" population estimate for each municipal WUG was developed. To estimate the water demand in the 2001 RWP, the year 2000 water use rate was estimated. These water use rates were based on reported 1996 water use data from suppliers or used the TWDB water use rates based on data from the years 1982 to 1991. Since there are multiple methods used to develop population projections and gallons per capita day estimates in the 2001 RWP, it is expected that there are variances between the 2001 RWP projections and the 2006 RWP projections.

Specifically for manufacturing WUGs, the changes in projected water demands between the 2001 Regional Water Plan and the proposed 2006 Regional Water Plan are a function of using the 2000 industrial water use survey versus using the 1997 RWP projections (the 2001 RWP manufacturing projections used the 1997 RWP projections). Manufacturing trends developed by Waterstone Environmental Hydrology and Engineering, Inc. were used to project the baseline year 2000 demand projection to year 2060 in the proposed 2006 Regional Water Plan.

Specifically for irrigation WUGs, the changes in projected water demands between the 2001 Regional Water Plan and the proposed 2006 Regional Water Plan are a function of the projection methodology adjustments. The 2001 RWP projections were based on a report developed by Texas A&M University. The 2006 RWP projections which were based on either the 2002 State Water Plan projections or the largest of the five-year average in years 1995-1999. The Region H Planning Group decided to use the larger of the two projection methodologies on a county-by-county basis.

Specifically for steam-electric power and mining WUGs, the changes in projected water demands between the 2001 Regional Water Plan and the proposed 2006 Regional Water Plan are a function of projection methodology. The 2001 RWP projections were based on the 1997 RWP projections as opposed to the 2006 RWP projections, which were based on a year 2000 water use survey and projected to year 2060 with trends developed by Waterstone Environmental Hydrology and Engineering, Inc.

Specifically for livestock WUGs, the changes in projected water demands between the 2001 Regional Water Plan and the proposed 2006 Regional Water Plan are a function of an updated water/livestock survey. However, the livestock demand projections are based on the same trend lines as the 2001 RWP projections.

Comment 30 – Harris County municipal demand figures, commercial demands, and the process used for regional water planning and population projections

See response to comments 11 through 29 above for changes in Harris County demand projections between the 2001 Regional Water Plan and the 2006 Regional Water Plan. The separation of commercial and municipal water demands is not currently part of the scope of work nor in accordance with TWDB guidelines. While it is understood that commercial and municipal water uses do not necessarily follow the same trends, much of the commercial demand shows up in water use reports submitted by the municipal WUGs and WWPs (i.e., municipalities and MUDs) which are the basis for the 2006 regional water demand projections. Individual commercial entities are not required to submit water usage records and municipal WUGs and WWPs are also not required to separate commercial usage from the total usage. The TWDB could consider such a change for future regional plans. However, this information is not currently available for this round of planning. See response to other comments above regarding the process and methodology used to develop population projections for Region H. **No changes are recommended to Chapter 2 in response to this comment.**

Comments to Chapter 6 – Water Conservation and Drought Management Recommendations

Comment 1 – enforceability of water conservation measures

Chapter 6 provides information to the public regarding who is required to develop a water conservation plan and the specific information and requirements associated with that plan, including enforceability. The current lack of enforceability for targeted water savings should be presented accurately in the report. **No changes are recommended to Chapter 2 in response to this comment.**

Comment 2 – enforceability of drought contingency plans

See response to Comment 1 above. **No changes are recommended to Chapter 2 in response to this comment.**

Comments to Region H Water Management Strategy Analysis Technical Memorandum for Municipal Conservation

Several changes have been made to the technical memorandum for municipal conservation to better clarify the process followed and the recommendations provided in this document. A revised draft of the technical memorandum will be available at a future Region H meeting. In general, the following responses are provided to address the comments submitted.

Additional responses to the water conservation survey have been received since the original development of the technical memorandum. Approximately 36% of the total surveys mailed were returned to the group, which is an increase of approximately 8% since the original technical memorandum was developed.

The intent of the technical memorandum was not to limit recommended conservation strategies, such as water conservation pricing, for the region. The Region H consultant team recommends that all of the BMPs included in the TWDB water conservation task force report be included as potentially feasible BMPs in this strategy. This recommendation is more clearly defined in the revised strategy.

Three different groups of municipal WUGs, based on size, were established for estimating potential water savings and costs for the region. Various levels intensity for water conservation programs are anticipated depending on the size and related resources available for each WUG to implement a conservation program. It is expected that larger entities, with generally greater resources and larger demands, will have more resources and more incentive to develop more comprehensive conservation programs than will be available to smaller entities. The three groups of WUG sizes were established to address this assumption.

We appreciate your interest and comments.

Sincerely,

Michael V. Reedy, P.E.
Project Director

cc: Andy Sterbenz, KBR
Region H RWPG Committee

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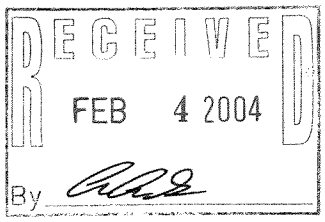

January 26, 2005

Mr. Jim Adams
Chair
Region H Water Planning Group
General Manager
San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305-0329

and

Mr. Andrew A. Sterbenz
Project Manager, Infrastructure
KBR
P. O. Box 3 (77001-0003)
4100 Clinton Drive, 03-1107G
Houston, Texas 77020-6237

Dear Jim and Andrew,

Enclosed are the comments of the Houston Regional Group of the Sierra Club (Sierra Club) regarding the draft of Chapter 3 of the Region H Water Plan and other documents that we received at the January 5, 2005 Region H meeting.

1) **In the December 10, 2004 Turner Collie & Braden memorandum, page 1,** the Sierra Club requests that Region H evaluate as a management strategy the transfers of surplus water to meet the individual shortages that WUGs have.

2) **In the December 10, 2004 Turner Collie & Braden memorandum, page 1,** the Sierra Club requests that Region H evaluate as a management strategy interruptible supplies of water.

3) **In the Region H Water Planning Group (RHWPG) December 22, 2004 letter, page 1,** the Sierra Club does not agree that Regional Water Planning Groups are not legal authorities or governmental entities. The Sierra Club believes that the RHWPG should require entities to seek changes to the Region H Water Plan, when it is appropriate, so that they can approach the Texas Water Development Board (TWDB) for funding. The entire idea of local control, which Senate Bills 1 and 2 embody, envisioned a group composed of local interests making important decisions and recommendations and referring these to the

TWDB who has the authority to change these if it so desires. The RHWPG, in this way, is operating as it should.

4) **In the Region H Water Planning Group (RHWPG) December 22, 2004 letter, page 2,** the Sierra Club does not agree that "A water right application should require no more than a simple majority vote of the planning group at an open meeting to be considered consistent with the plan by the TWDB and TCEQ." It is important to remember that the water rights applications that have been much discussed, including those by the City of Houston, San Jacinto River Authority, Brazos River Authority, are not small items of concern. These water rights applications are significant because they tie up in perpetuity the rest of the water that is available in various basins. This is being done with no foreseen need and no specific projected needs planned for right now. As Jeff Taylor stated at the January 5, 2005 RHWPG meeting, the City of Houston applied for all the water it did because it had to protect its interests. This alone indicates the seriousness of the problem and the need for light to shine on these public issues. That Region H wants to pass these issues off as not important is of great concern for its ability to speak and protect the public interest.

5) **In the Consultant's Report, January 5, 2005, Part 2, the page with the heading, Harris County,** a potential strategy is "Additional Lake Houston Yield". The Sierra Club would appreciate an explanation of how this yield would be obtained.

6) **In the Consultant's Report, January 5, 2005, Part 2, the pages with the heading North Montgomery County and South Montgomery County,** the Bedias Reservoir transfer to Lake Conroe, is listed as a potential strategy. The Sierra Club is opposed to the proposal because of the impacts it would have on the West Fork of the San Jacinto River, the bottomland hardwood habitat that exists along the West Fork, and Sam Houston National Forest.

7) **In the Consultant's Report, January 5, 2005, Part 2, the page with the heading South Montgomery County,** a potential strategy is Toledo Bend to Lake Houston transfer. The Sierra Club is against this transfer because of the ecological impacts it may have on East Texas and the Region H Area.

8) **In the Consultant's Report, January 5, 2005, Part 2, the pages with the heading South Montgomery County and Waller County,** a potential strategy is for the Trinity River Authority to contract water to the San Jacinto River Authority via Lake Houston. The Sierra Club is concerned about the potential environmental impacts that alternative routes may have.

9) **In the Consultant's Report, January 5, 2005, Part 2, the page with the heading Screening Criteria,** "Local Preference" should include the willingness to pay for the project.

10) **In the Consultant's Report, January 5, 2005, Part 2, the page with the heading Screening Criteria,** "Environment" should also include instream flow needs and inflows into bays and estuaries.

11) **In the Consultant's Report, January 5, 2005, Part 2, the page with the heading Screening Criteria,** "Institutional Constraints" should include the quality of the water and its proximity to use.

12) **In the Consultant's Report, January 5, 2005, Part 2, the page with the heading Screening Criteria,** under "Impacts on Water Resources and other Strategies", what does "reasonably mitigated" mean.

13) **In the slide presentation that begins with Municipal Conservation City of Houston Plan, the Industrial Conservation Constraints slide, page 8,** the Sierra Club supports a required program of water conservation for industry.

14) **In the slide presentation that begins with Municipal Conservation City of Houston Plan, the Groundwater Supply Update, page 11,** there was discussion at the January 5, 2005 RHWPG meeting about Huntsville proposing to drill wells in the Jasper part of the Gulf Coast Aquifer in southern Walker County. A concern was expressed by the Lone Star Groundwater Conservation District that this activity could result in a conflict between it and the Bluebonnet Groundwater Conservation District. What is the status of this issue and what role will Region H play in its resolution or what the Region H Water Plan (RHWP) says about resolving such conflicts.

15) **In the slide presentation that begins with Municipal Conservation City of Houston Plan, pages 15-17,** there is discussion about East Texas Interbasin Transfers. The Sierra Club is opposed to large-scale transfers because of the impacts that will occur in East Texas and the Houston Area. It was very revealing that neither the San Jacinto River Authority or the City of Houston at the January 5, 2005 meeting wanted their names associated with the East Texas Interbasin Transfer although both entities in the past have studied and supported such transfers.

16) **Region H Water Management Strategy Analysis Technical Memorandum, Irrigation Conservation, December 7, 2004, Issues and Considerations,** this document states that "Although there are no quantifiable negative environmental impacts, it is difficult to estimate the potential beneficial environmental impacts." One way to quantify environmental benefits is to estimate the water savings and then calculate a certain instream flow or flow to bays and estuaries that would not have occurred without water conservation.

17) **Region H Water Management Strategy Screening, chart on 11 x 17 inch paper,** the Sierra Club is opposed to implementing the Bedias Reservoir and the

Sabine to Region H Transfer management strategies due to the environmental impacts that these projects will cause in East Texas and the Houston Area.

18) **Region C Water Planning Group December 30, 2004 letter,** the Sierra Club is not in favor of the sentiments expressed under "Federal/State Actions in Conflict with the Water Plan". There is little quality bottomland hardwood forested wetlands left in Texas and the idea that these areas, which have already been destroyed or had their ecological functions significantly reduced in many areas, should make way for additional water projects is not acceptable.

The Sierra Club is glad that the U.S. Fish & Wildlife Service, Texas Parks & Wildlife Department, and other natural resource agencies are interested in and do protect the little Texas natural heritage that we have left. It is short-sighted and hypocritical to talk about "interference by state or federal government action" when in fact many local parties want federal and state subsidies but at the same time want to exempt themselves from the responsibility that goes with accepting these funds, which includes protecting the environment.

19) Regarding the comment made at the January 5, 2005 Region H meeting that the Attorney-General has stated that members can vote even if there is an appearance of a conflict of interest, we respectfully disagree. The public is not served by people voting for projects that will benefit the agency they work for or themselves.

20) Regarding the comment that the consultant made at the January 5, 2005 Region H meeting that limited environmental analysis had been conducted on the water rights applications that were approved by Region H; that little quantitative environmental analysis would be in the new Region H plan; and that not much more environmental analysis will be done than is now for the Region H plan; the Sierra Club objects. It appears that Region H is on the verge of abandoning its responsibility to ensure that environmental concerns are taken into account and that environmental protection is advocated when considering each management strategy.

Chapter 3 – Analysis of Current Water Supplies

1) **On page 3-2, 3.2.1 Groundwater Aquifers,** at the January 5, 2005 Region H meeting there was discussion about a City of Huntsville proposal to drill for groundwater in the Jasper portion of the Gulf Coast Aquifer. There was concern that two groundwater districts, the Bluebonnet Groundwater Conservation District and the Lone Star Groundwater Conservation District may have aims that would be in conflict with one another. This issue should be discussed here as well as how conflicts between different groundwater or other water entities will be resolved through the Region H process.

2) **On page 3-6, 3.2.3 Aquifer Conditions,** there should be a discussion about the recharge area and its condition regarding potential contamination and loss of recharge potential due to land surface hardening. This is particularly important since we are predicting, projecting, and estimating into the future 50 years (until 2060). The public must know in what condition its aquifer and recharge areas will be so it has some idea about what condition its groundwater supplies will be.

3) **On page 3-21, 3.3 Identification of Surface Water Sources,** how accurate (percent error) are the Water Availability Models (WAM)?

4) **On page 3-24, 3.3.1 Available Surface Water,** Chapter 3 should provide an estimate of the percent of reservoir capacity that currently and in 2060 exists so the public knows how much storage space there is in each of its surface water reservoirs. Which reservoirs will need to have their sediment supply reduced by 2060?

5) **On page 3-35, 3.3.5 Legal and Regulatory Constraints,** the Sierra Club is concerned about the statement "It is anticipated that new interbasin transfers will be needed to support growth throughout Region H, particularly to the San Jacinto and San Jacinto-Brazos Basins where the largest population growth is occurring." If Region H is in favor of supporting growth then it appears to have a policy or de facto policy that growth is good under the conditions that will develop in Region H. Is this a logical assumption to make when Region H is already beyond its carrying capacity? Region H does not appear to want to address population and development growth; its impacts on the environment; and whether it is best to support more growth in a condition of carry capacity exceedance unless it relates to assisting and supporting this growth with additional water supplies. These are policies that Region H should be clear about to the public so that the public is aware of what constraints and assumptions are in the Region H Water Plan.

6) **On page 3-41, 3.3.6.3 Unique River and Stream Segments,** when the time comes to review Chapter 8 the Sierra Club will suggest additional candidates for Unique River and Stream Segment designation.

7) **On page 3-42, Table 3-10, Major Recreational Water Rights in Region H,** are the recreational water rights listed for watering golf courses? The table should make clear how the water right is used.

8) **On page 3-43, 3.3.8 Recreational Uses,** why was such an old almanac (1998-1999, 6-7 years old) used for this analysis?

9) **On page 3-44, 3.4 Total Water Supply,** there will be 200,000 acre-feet/year less water in 2060 than we have now. However, population will be much greater (about double) and the carrying capacity will be exceeded more than it is today.

10) **On page 3-48, Brazoria County,** Chapter 3 states that "The communities of Clute, Lake Jackson, Oyster Creek, and Richwood were shown to experience shortages immediately in the 2000 period." Have these shortages occurred? What is the status of these areas today?

11) **On page 3-48, Brazoria County,** Chapter 3 states that "Livestock demands that were not met by this groundwater supply were assumed to be provided by local water supplies." What do local water supplies consist of for each county in Region H? Are shallow groundwater aquifers a part of "local supply"? How will shallow groundwater aquifer volumes and quality be protected by the Region H Water Plan?

12) **On page 3-48, Chambers County,** did Chambers County "experience groundwater shortages immediately in the 2000 planning period"?

13) **On page 3-49, Galveston and Harris Counties,** since urbanization is reducing the amount of land designated as agriculture or fragmenting what is left of agricultural land why will irrigation "not be able to entirely meet demands in this basin with groundwater alone"?

14) **On page 3-49, Fort Bend County,** why was it assumed "that all groundwater demands to irrigators could be met by exceeding the aquifer supply"? This is not what will be allowed by the subsidence district and other water regulatory entities.

15) **On page 3-51, Data Collection,** Chapter 3 states that "The remaining water supplies that were entered in Table 3G-1 are other permit amounts or assumed local supplies." What are these "assumed local supplies"? Do these include shallow groundwater aquifers? How will shallow groundwater aquifer volumes and quality be protected by the Region H Water Plan?

16) **On page 3-52, Supply Allocation,** Chapter 3 states that "it was assumed that local supplies could only be used to meet remaining shortages after groundwater and surface water allocation only for the 2000 planning period. This year 2000 local supply quantity was then assumed to be available through the year 2060." What are these "assumed local supplies"? Do these include shallow groundwater aquifers? How will shallow groundwater aquifer volumes and quality be protected by the Region H Water Plan?

17) **On page 3-56, County-Other in Harris County,** Chapter 3 states that "Unfortunately, it was not possible to obtain information concerning Pasadena's current water contracts." Why? Will information concerning Pasadena's current water contracts be obtained and included in the draft Region H Water Plan?

18) **In Appendix 3D, Previously Studied Potential Reservoir Sites,** the Sierra Club is not in favor of the Bedias, Humble, Cleveland, Lower Lake Creek,

Tennessee Colony, Harmons, Spring Creek Lake, and Upper Lake Creek water projects.

19) **In Appendix 3D, Previously Studied Potential Reservoir Sites,** for the Bedias, Cleveland, Lower Lake Creek, Millican/Panther Creek, Tehuacana, and Tennessee Colony water projects "endangered species have been identified" at the sites. What endangered species were identified at each site?

20) **In Appendix 3D, Previously Studied Potential Reservoir Sites,** for the Smaller Reservoir Sites, the table does not show what natural resources may be impacted by the proposed projects. This should be done.

21) **In Appendix 3D, Previously Studied Potential Reservoir Sites,** Spring Creek Lake, there is no information given in the comments column about the project. This column should be filled in.

22) **In Appendix 3D, Previously Studied Potential Reservoir Sites,** the Original Cost at Dam Million $ column should be updated with current prices so the public understands what the estimated costs will be. The costs that are provided look very low in relation to the actual price of each project.

23) **In Appendix 3F, Region H Recreational Use Information,** this table is confusing. The list of Special Features is incomplete. For instance, the East and West Forks of the San Jacinto River should have Sam Houston National Forest and bottomland hardwoods under Special Features. Spring And Cypress Creeks should have parks and bottomland hardwoods listed. Peach Creek should have bottomland hardwoods listed. Greens Bayou, from Highway 90 to I-10, should have bottomland hardwoods listed. Armand Bayou Tidal, should have the Armand Bayou Nature Center listed. East Bay should have Anahuac National Wildlife Refuge listed. Clear Lake should have boat recreation listed. Big Thicket National Preserve has no Special Features listed for it. Lake Charlotte should have a cypress swamp listed. Old River Lake and Lost Lake should have the protected Corps of Engineers Wallisville area listed. Sam Houston National Forest should have no hares listed and should have listed the endangered Red-cockaded Woodpecker. Davy Crockett National Forest has no Special Features listed but should. Stephan F. Austin State Park should have the Brazos River listed. Lake Houston should have Lake Houston State Park and Duessen and Eisenhower parks listed. W.G. Jones State Forest should have endangered Red-cockaded Woodpeckers listed. Alabama Creek Wildlife Management Area should have Red-cockaded Woopeckers listed and no hares. Huntsville State Park should have bottomland hardwoods listed. This table needs to be redone.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt

Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, Texas 77096
713-664-5962

February 15, 2005

Mr. Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew St.
Houston, TX 77096

Re: **Response to Comments on Draft Chapter 3 of the 2006 Region H Regional Water Plan**

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input to Draft Report Chapter 3 of the 2006 Regional Water Plan. The following letter provides responses to the comments you provided in your letter dated January 26, 2005.

Comments on January 5 Meeting Materials

1) In the December 10, 2004 Turner Collie & Braden memorandum, page 1, the Sierra Club requests that Region H evaluate as a management strategy the transfers of surplus water to meet the individual shortages that WUGs have.

That strategy is being considered for non-municipal WUG's with surpluses. The technical memorandum on Contractual Transfers will appear in Chapter 4.

2) In the December 10, 2004 Turner Collie & Braden memorandum, page 1, the Sierra Club requests that Region H evaluate as a management strategy interruptible supplies of water.

The TWDB rules currently require that all recommended strategies be reliable during the drought of record. The identification of irrigators with less reliable water rights frames the discussion of potential management strategies, because they would be less receptive to expensive strategies which developed frrm water supplies (such as an interbasin transfer) than to conservation or drought management measures.

3) In the Region H Water Planning Group (RHWPG) December 22, 2004 letter, page 1, the Sierra Club does not agree that Regional Water Planning Groups are not legal authorities or governmental entities. The Sierra Club believes that the RHWPG should require entities to seek changes to the Region H Water Plan, when it is appropriate, so that they can approach the Texas Water Development Board (TWDB) for funding. The entire idea of local control, which Senate Bills 1 and 2 embody, envisioned a group composed of local interests making important decisions and recommendations and referring these to the TWDB who has the authority to change these if it so desires. The RHWPG, in this way, is operating as it should.

The Regional Water Planning groups are not elected, and therefore they do not feel they should have the authority to veto a strategy or contract option pursued by an elected body. Political subdivisions must have the ability to study multiple management strategies and select those particular strategies that will best serve their needs. If an entity requests that a locally-selected management strategy be added to the

regional plan, the regional planning is obligated to consider it as an amendment or in the next planning cycle.

4) In the Region H Water Planning Group (RHWPG) December 22, 2004 letter, page 2, the Sierra Club does not agree that "A water right application should require no more than a simple majority vote of the planning group at an open meeting to be considered consistent with the plan by the TWDB and TCEQ." It is important to remember that the water rights applications that have been much discussed, including those by the City of Houston, San Jacinto River Authority, Brazos River Authority, are not small items of concern. These water rights applications are significant because they tie up in perpetuity the rest of the water that is available in various basins. This is being done with no foreseen need and no specific projected needs planned for right now. As Jeff Taylor stated at the January 5, 2005 RHWPG meeting, the City of Houston applied for all the water it did because it had to protect its interests. This alone indicates the seriousness of the problem and the need for light to shine on these public issues. That Region H wants to pass these issues off as not important is of great concern for its ability to speak and protect the public interest.

Again, the Regional Water Planning groups are not elected, and they do not have the budget or resources to study every water right application within their region. The state agencies (TCEQ, TWDB and TPWD) have the mandate and the staff to perform this analysis. By defining a permit as "consistent with the plan but not recommended as a strategy," the state agencies could begin their detailed analysis. The planning group could then consider it as a potential strategy during the next planning cycle. Those wishing to comment on the water right could still approach the TCEQ, as they can today, or the RWPG, when it is considered in the appropriate public meeting.

5) In the Consultant's Report, January 5, 2005, Part 2, the page with the heading, Harris County, a potential strategy is "Additional Lake Houston Yield". The Sierra Club would appreciate an explanation of how this yield would be obtained.

The yield of a water right is determined by simulating the water right under drought of record conditions using the WAM model. The amount of water that can be diverted in every year of the simulation is the firm yield. For a reservoir, the firm yield is directly related to storage capacity, because you are diverting stored water and not run-of-river flows during a drought. Bathymetric surveys of Lake Houston show that it has more storage capacity than originally permitted, and this additional storage capacity extends the yield of the lake by about 32,000 acre-feet per year. A technical memorandum on water rights applications in the San Jacinto Basin will be provided in Chapter 4.

6) In the Consultant's Report, January 5, 2005, Part 2, the pages with the heading North Montgomery County and South Montgomery County, the Bedias Reservoir transfer to Lake Conroe, is listed as a potential strategy. The Sierra Club is opposed to the proposal because of the impacts it would have on the West Fork of the San Jacinto River, the bottomland hardwood habitat that exists along the West Fork, and Sam Houston National Forest.

Your opposition to this project is noted.

7) In the Consultant's Report, January 5, 2005, Part 2, the page with the heading South Montgomery County, a potential strategy is Toledo Bend to Lake Houston transfer. The Sierra Club is against this transfer because of the ecological impacts it may have on East Texas and the Region H Area.

Your opposition to this project is noted.

8) In the Consultant's Report, January 5, 2005, Part 2, the pages with the heading South Montgomery County and Waller County, a potential strategy is for the Trinity River Authority to contract water to the San Jacinto River Authority via Lake Houston. The Sierra Club is concerned about the potential environmental impacts that alternative routes may have.

Your concern related to this project is noted.

9) In the Consultant's Report, January 5, 2005, Part 2, the page with the heading Screening Criteria, "Local Preference" should include the willingness to pay for the project.

That is a good criterion. We assumed an active local sponsor would also be willing to pay for the project.

10) In the Consultant's Report, January 5, 2005, Part 2, the page with the heading Screening Criteria, "Environment" should also include instream flow needs and inflows into bays and estuaries.

The planning group directed we separate the category into Environment (wetlands and habitat impacts) and Impacts on Water Resources (instream flows, bays and estuaries and groundwater impacts).

11) In the Consultant's Report, January 5, 2005, Part 2, the page with the heading Screening Criteria, "Institutional Constraints" should include the quality of the water and its proximity to use.

The planning group directed we add categories for Location (proximity) and Water Quality.

12) In the Consultant's Report, January 5, 2005, Part 2, the page with the heading Screening Criteria, under "Impacts on Water Resources and other Strategies", what does "reasonably mitigated" mean.

Mitigation refers to wetlands or habitat offsets. Sites containing no unique species can be reconstructed elsewhere so that there is no net loss of habitat lands. This criterion now falls under the Environment category.

13) In the slide presentation that begins with Municipal Conservation City of Houston Plan, the Industrial Conservation Constraints slide, page 8, the Sierra Club supports a required program of water conservation for industry.

The planning group also supports conservation. The difficulty is in quantifying the cost and water savings across the diversity of industries so that it may be applied to the region as a whole and entered into the planning database. Similar to the recommended Industrial Reuse Strategy for ship channel industries sponsored by the City of Houston, additional industrial conservation strategies and resulting savings will be incorporated in subsequent regional plans as specific entities develop these plans over time.

14) In the slide presentation that begins with Municipal Conservation City of Houston Plan, the Groundwater Supply Update, page 11, there was discussion at the January 5, 2005 RHWPG meeting about Huntsville proposing to drill wells in the Jasper part of the Gulf Coast Aquifer in southern Walker County. A concern was expressed by the Lone Star Groundwater Conservation District that this activity could result in a conflict between it and the Bluebonnet Groundwater Conservation District. What is the status of this issue and what role will Region H play in its resolution or what the Region H Water Plan (RHWP) says about resolving such conflicts.

The status of this particular issue is not known. However, it is not the responsibility of the Region H Planning Committee to resolve technical issues between two groundwater conservation districts. The groundwater conservation districts are responsible and have jurisdiction for their respective areas to regulate and enforce rules associated with groundwater pumping. No changes are recommended to Chapter 3 in response to this comment.

15) In the slide presentation that begins with Municipal Conservation City of Houston Plan, pages 15-17, there is discussion about East Texas Interbasin Transfers. The Sierra Club is opposed to large-scale transfers because of the impacts that will occur in East Texas and the Houston Area. It was very revealing that neither the San Jacinto River Authority or the City of Houston at the January 5, 2005 meeting wanted their names associated with the East Texas Interbasin Transfer although both entities in the past have studied and supported such transfers.

Your opposition to interbasin transfers is noted.

16) Region H Water Management Strategy Analysis Technical Memorandum, Irrigation Conservation, December 7, 2004, Issues and Considerations, this document states that "Although there are no quantifiable negative environmental impacts, it is difficult to estimate the potential beneficial environmental impacts." One way to quantify environmental benefits is to estimate the water savings and then calculate a certain instream flow or flow to bays and estuaries that would not have occurred without water conservation.

That is a potential method of estimating the benefits. Water conservation is an important strategy for reducing long-term water demands for Region H and should be implemented where feasible and economical. However, as you pointed out in your last letter, the increases in water demand over time may ultimately exceed the conservation savings. Irrigation users using contract water supplies may reduce their demands through conservation. However, this excess contract water supply may then be made available to meet other water needs (i.e., municipal). Qualitatively it is reasonable to expect positive beneficial impacts as a result of water conservation. However, due to the reasons stated above and the relative unpredictability of how and how much conservation will actually be implemented makes a quantitative estimate difficult to predict.

17) Region H Water Management Strategy Screening, chart on 11 x 17 inch paper, the Sierra Club is opposed to implementing the Bedias Reservoir and the Sabine to Region H Transfer management strategies due to the environmental impacts that these projects will cause in East Texas and the Houston Area.

Your opposition is noted.

18) Region C Water Planning Group December 30, 2004 letter, the Sierra Club is not in favor of the sentiments expressed under "Federal/State Actions in Conflict with the Water Plan". There is little quality bottomland hardwood forested wetlands left in Texas and the idea that these areas, which have already been destroyed or had their ecological functions significantly reduced in many areas, should make way for additional water projects is not acceptable.
The Sierra Club is glad that the U.S. Fish & Wildlife Service, Texas Parks & Wildlife Department, and other natural resource agencies are interested in and do protect the little Texas natural heritage that we have left. It is short-sighted and hypocritical to talk about "interference by state or federal government action" when in fact many local parties want federal and state subsidies but at the same time want to exempt themselves from the responsibility that goes with accepting these funds, which includes protecting the environment.

This comment should be directed to the Region C Planning Group.

19) Regarding the comment made at the January 5, 2005 Region H meeting that the Attorney-General has stated that members can vote even if there is an appearance of a conflict of interest, we respectfully disagree. The public is not served by people voting for projects that will benefit the agency they work for or themselves.

The Texas Water Code specifies which interests must be represented on the Regional Water Planning Groups. This list includes Cities, Counties, Water Districts and River Authorities. The Water Code also requires Regional Water Planning Groups to recommend water management strategies to address projected water shortages. These strategies will, most likely, be implemented by Cities, Counties, Water Districts and River Authorities. It seems unreasonable to propose that long-range planning be conducted in the absence and without the consent and approval of these groups.

20) Regarding the comment that the consultant made at the January 5, 2005 Region H meeting that limited environmental analysis had been conducted on the water rights applications that were approved by Region H; that little quantitative environmental analysis would be in the new Region H plan; and that not much more environmental analysis will be done than is now for the Region H plan; the Sierra Club objects. It appears that Region H is on the verge of abandoning its responsibility to ensure that environmental concerns are taken into account and that environmental protection is advocated when considering each management strategy.

The analysis documented in the plan Amendment Report was based in part on the data provided in the permit applications. Several of those applications were based on detailed studies (such as the BRA Systems Operations Permit) which provided either completed environmental analysis or sufficient data to perform that analysis. These strategies were documented in several technical memoranda. Other permits contained little or no specific environmental data, and therefore only limited analysis could be performed under this regional planning program. In carrying the strategies forward to the 2006 plan, additional investigations have been made to complete a comparative environmental analysis, but no new data on these strategies has been provided.

Comments on Chapter 3 – Analysis of Current Water Supplies

1) On page 3-2, 3.2.1 Groundwater Aquifers, at the January 5, 2005 Region H meeting there was discussion about a City of Huntsville proposal to drill for groundwater in the Jasper portion of the Gulf Coast Aquifer. There was concern that two groundwater districts, the Bluebonnet Groundwater Conservation District and the Lone Star Groundwater Conservation District may have aims that would be in conflict with one another. This issue should be discussed here as well as how conflicts between different groundwater or other water entities will be resolved through the Region H process.

Comment noted, but it is not the responsibility of the Region H Planning Committee to resolve technical issues between two groundwater conservation districts. No changes are recommended to Chapter 3 in response to this comment.

2) On page 3-6, 3.2.3 Aquifer Conditions, there should be a discussion about the recharge area and its condition regarding potential contamination and loss of recharge potential due to land surface hardening. This is particularly important since we are predicting, projecting, and estimating into the future 50 years (until 2060). The public must know in what condition its aquifer and recharge areas will be so it has some idea about what condition its groundwater supplies will be.

As required by TWDB Regional Planning Guidelines, estimates of groundwater supply were developed using either the results from the TWDB Groundwater Availability Models (GAMs) or were based on limitations imposed by Groundwater Conservation Districts in the region. In general, most of the major aquifer recharge areas in Region H are located in areas of the region where less development and growth has historically occurred. If these development trends change and more development occurs in these recharge areas, the recharge rates included in the GAMs should also change over time and the available supplies will be adjusted in subsequent planning horizons. No changes are recommended to Chapter 3 in response to this comment.

3) On page 3-21, 3.3 Identification of Surface Water Sources, how accurate (percent error) are the Water Availability Models (WAM)?

The WAM is a statistical model, not a predictive model, and therefore a percent error is not typically derived. The WAM tests a scenario against a fixed set of conditions, so that the statistical outputs of two or more scenarios may be compared. Scenarios are based on sets of assumptions and conditions, which may never occur in reality but offer a framework for the comparative analysis. For example, water rights are tested using WAM Run 3. This scenario includes these assumptions: (1) every water right holder will try to divert his full authorized amount every year, regardless of rainfall; (2) every water right holder will only divert the portion of the stream flow he is authorized, and leave the portion allocated to senior downstream water rights holders; and (3) the only return flows made to the streams are those specifically required by the water rights permits. While it is unlikely that this scenario will occur, it can be consistently applied to test new water rights, so that the statistical frequency of meeting diversion and in-stream flow targets can be compared.

4) On page 3-24, 3.3.1 Available Surface Water, Chapter 3 should provide an estimate of the percent of reservoir capacity that currently and in 2060 exists so the public knows how much storage space there is in each of its surface water reservoirs. Which reservoirs will need to have their sediment supply reduced by 2060?

Storage and sediment volumes will be discussed in more detail in chapter 4, but a reservoir volume table can be added to Chapter 3. Sediment removal is not being currently considered as a management strategy because the yield gained does not justify cost and impacts of dredging. Dredging may be considered in future plans.

5) On page 3-35, 3.3.5 Legal and Regulatory Constraints, the Sierra Club is concerned about the statement "It is anticipated that new interbasin transfers will be needed to support growth throughout Region H, particularly to the San Jacinto and San Jacinto-Brazos Basins where the largest population growth is occurring." If Region H is in favor of supporting growth then it appears to have a policy or de facto policy that growth is good under the conditions that will develop in Region H. Is this a logical assumption to make when Region H is already beyond its carrying capacity? Region H does not appear to want to address population and development growth; its impacts on the environment; and whether it is best to support more growth in a condition of carry capacity exceedance unless it relates to assisting and supporting this growth with additional water supplies. These are policies that Region H should be clear about to the public so that the public is aware of what constraints and assumptions are in the Region H Water Plan.

The population and demand models used for regional planning are managed by the TWDB. The Regional Water Planning Groups are mandated to identify and address water shortages, not to determine the ideal population for the region.

6) On page 3-41, 3.3.6.3 Unique River and Stream Segments, when the time comes to review Chapter 8 the Sierra Club will suggest additional candidates for Unique River and Stream Segment designation.

Please submit your recommended stream segments as soon as possible. We will begin that analysis in mid-February, and would like to have all the candidate streams identified. We will begin with the TPWD list of ecologically significant streams published in 2002.

7) On page 3-42, Table 3-10, Major Recreational Water Rights in Region H, are the recreational water rights listed for watering golf courses? The table should make clear how the water right is used.

Golf course irrigation is considered an irrigation water right. Recreational water rights generally apply to amenity lakes, but can include fishing lakes, man-made wetlands for waterfowl hunting, and in-stream flows for boating.

8) On page 3-43, 3.3.8 Recreational Uses, why was such an old almanac (1998-1999, 6-7 years old) used for this analysis?

As you read in the text, this was one of many references cited. The most recent data was obtained from the website of Texas Parks and Wildlife Department website.

9) On page 3-44, 3.4 Total Water Supply, there will be 200,000 acre-feet/year less water in 2060 than we have now. However, population will be much greater (about double) and the carrying capacity will be exceeded more than it is today.

The primary reason that water supply is reduced in 2060 is due to rules enacted by the Subsidence Districts to reduce groundwater pumpage and resulting subsidence.

10) On page 3-48, Brazoria County, Chapter 3 states that "The communities of Clute, Lake Jackson, Oyster Creek, and Richwood were shown to experience shortages immediately in the 2000 period." Have these shortages occurred? What is the status of these areas today?

We do not have any data to support that these shortages actually occurred. Some groundwater aquifers may be over-pumped in some years without a noticeable impact on water levels. Subsequent discussions with Brazosport Water Authority (BWA), the water provider for the entities referenced in your comment above, indicate that these entities pump groundwater in excess of the groundwater supplies currently allocated to these entities in the regional plan. Therefore, these reported shortages for year 2000 were likely met through groundwater pumping. This section will be reworded to make this clearer.

11) On page 3-48, Brazoria County, Chapter 3 states that "Livestock demands that were not met by this groundwater supply were assumed to be provided by local water supplies." What do local water supplies consist of for each county in Region H? Are shallow groundwater aquifers a part of "local supply"? How will shallow groundwater aquifer volumes and quality be protected by the Region H Water Plan?

Local livestock supplies within the region are predominantly stock ponds. Under the TCEQ rules, a landowner may impound up to 200 acre-feet of water without a water right. There are numerous such ponds throughout this region.

12) On page 3-48, Chambers County, did Chambers County "experience groundwater shortages immediately in the 2000 planning period"?

We do not have any data to support that these shortages actually occurred. Some groundwater aquifers may be over-pumped in some years without a noticeable impact on water levels. Therefore, the shortages indicted for the year 2000 could have actually been met through groundwater pumping. In addition, Chambers County does not rely exclusively on groundwater to meet demands and the available surface water supplies are not fully allocated in the County. A portion of the surface water supplies in Chambers County are considered interruptible supplies. While these interruptible supplies cannot be used by the regional planning group to meet projected shortages, it is possible that these supplies were used in the year 2000 to meet demands in Chambers County. This section will be reworded to make this clearer.

13) On page 3-49, Galveston and Harris Counties, since urbanization is reducing the amount of land designated as agriculture or fragmenting what is left of agricultural land why will irrigation "not be able to entirely meet demands in this basin with groundwater alone"?

Many of these irrigators rely on surface water to meet their demands, and may not have groundwater well capacity in place as an alternative.

14) On page 3-49, Fort Bend County, why was it assumed "that all groundwater demands to irrigators could be met by exceeding the aquifer supply"? This is not what will be allowed by the subsidence district and other water regulatory entities.

The available supply in Fort Bend County is not necessarily the available yield of the aquifer, but instead represents the regulated supply based on current subsidence district rules and required groundwater reductions. The subsidence district rules require that all well permittees reduce groundwater pumpage in Fort Bend County with the exception of agricultural wells and some small private domestic wells such as those utilized by the residences of the Village of Pleak. Therefore, it was assumed that these groundwater users would not be required to reduce groundwater pumpage over the planning period and could continue to meet their projected demands using groundwater supplies. A sentence clarifying available versus regulated will be added to Section 3.4.1 – Fort Bend County in the report.

15) On page 3-51, Data Collection, Chapter 3 states that "The remaining water supplies that were entered in Table 3G-1 are other permit amounts or assumed local supplies." What are these "assumed local supplies"? Do these include shallow groundwater aquifers? How will shallow groundwater aquifer volumes and quality be protected by the Region H Water Plan?

Local supplies within the region are predominantly stock ponds. Under the TCEQ rules, a landowner may impound up to 200 acre-feet of water without a water right. There are numerous such ponds throughout this region.

16) On page 3-52, Supply Allocation, Chapter 3 states that "it was assumed that local supplies could only be used to meet remaining shortages after groundwater and surface water allocation only for the 2000 planning period. This year 2000 local supply quantity was then assumed to be available through the year 2060." What are these "assumed local supplies"? Do these include shallow groundwater aquifers? How will shallow groundwater aquifer volumes and quality be protected by the Region H Water Plan?

Local supplies within the region are predominantly stock ponds. Under the TCEQ rules, a landowner may impound up to 200 acre-feet of water without a water right. There are numerous such ponds throughout this region.

17) On page 3-56, County-Other in Harris County, Chapter 3 states that "Unfortunately, it was not possible to obtain information concerning Pasadena's current water contracts." Why? Will information

concerning Pasadena's current water contracts be obtained and included in the draft Region H Water Plan?

Multiple attempts have been made to obtain contract information from the City of Pasadena. Contract information was not obtained; therefore, it was assumed that the 2001 RWP customers were most likely still contract customers of the City of Pasadena. The sentence, "Unfortunately, it was not possible to obtain information concerning Pasadena's current water contracts", will be removed from Section 3.4.1 and will be replaced with "Contract information was not available from the City of Pasadena and therefore information used in the 2001 Region H Regional Water Plan was used for this current plan".

18) In Appendix 3D, Previously Studied Potential Reservoir Sites, the Sierra Club is not in favor of the Bedias, Humble, Cleveland, Lower Lake Creek, Tennessee Colony, Harmons, Spring Creek Lake, and Upper Lake Creek water projects.

Your opposition is noted. This table is solely a list of previously studied projects, intended as a reference guide.

19) In Appendix 3D, Previously Studied Potential Reservoir Sites, for the Bedias, Cleveland, Lower Lake Creek, Millican/Panther Creek, Tehuacana, and Tennessee Colony water projects "endangered species have been identified" at the sites. What endangered species were identified at each site?

Endangered species data, where available from previous studies, will be included in the reservoirs technical memorandum in chapter 4. Because this is intended only as a summary reference table, no additional site studies were performed for this report.

20) In Appendix 3D, Previously Studied Potential Reservoir Sites, for the Smaller Reservoir Sites, the table does not show what natural resources may be impacted by the proposed projects. This should be done.

When data was not available in the referenced report, the table entry was left blank. Because this is intended only as a summary reference table, no additional site studies were performed for this report.

21) In Appendix 3D, Previously Studied Potential Reservoir Sites, Spring Creek Lake, there is no information given in the comments column about the project. This column should be filled in.

When data was not available in the referenced report, the table entry was left blank. Because this is intended only as a summary reference table, no additional site studies were performed for this report.

22) In Appendix 3D, Previously Studied Potential Reservoir Sites, the Original Cost at Dam Million $ column should be updated with current prices so the public understands what the estimated costs will be. The costs that are provided look very low in relation to the actual price of each project.

The costs in this table are labeled with the date of the estimate. Again, this is only intended as a summary reference table. Projects considered as management strategies will be addressed in Chapter 4 through more detailed technical memoranda. That section of the report updates the cost estimates to reflect Second Quarter 2002 values (which is the standard cost index for all 2006 Regional Water Plans).

23) In Appendix 3F, Region H Recreational Use Information, this table is confusing. The list of Special Features is incomplete. For instance, the East and West Forks of the San Jacinto River should have Sam Houston National Forest and bottomland hardwoods under Special Features. Spring And Cypress

Creeks should have parks and bottomland hardwoods listed. Peach Creek should have bottomland hardwoods listed. Greens Bayou, from Highway 90 to I-10, should have bottomland hardwoods listed. Armand Bayou Tidal, should have the Armand Bayou Nature Center listed. East Bay should have Anahuac National Wildlife Refuge listed. Clear Lake should have boat recreation listed. Big Thicket National Preserve has no Special Features listed for it. Lake Charlotte should have a cypress swamp listed. Old River Lake and Lost Lake should have the protected Corps of Engineers Wallisville area listed. Sam Houston National Forest should have no hares listed and should have listed the endangered Red-cockaded Woodpecker. Davy Crockett National Forest has no Special Features listed but should. Stephan F. Austin State Park should have the Brazos River listed. Lake Houston should have Lake Houston State Park and Duessen and Eisenhower parks listed. W.G. Jones State Forest should have endangered Red-cockaded Woodpeckers listed. Alabama Creek Wildlife Management Area should have Red-cockaded Woopeckers listed and no hares. Huntsville State Park should have bottomland hardwoods listed. This table needs to be redone.

These tables attempt to summarize voluminous reports as a quick reference. Your notes and additions will be added to the table. We will improve the titles and headers to make the data more understandable, but the reader will still be required to read the referenced reports if detailed information is desired.

We appreciate your interest and comments.

Sincerely,

Andrew A. Sterbenz, P.E.
Project Manager

cc: Mike Reedy, TCB
Region H RWPG Committee

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February 4, 2005

Mr. Andrew A. Sterbenz
Project Manager, Infrastructure
KBR
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4100 Clinton Drive, 03-1107G
Houston, Texas 77020-6237

Dear Andy,

Enclosed is the recommendation by the Houston Sierra Club (HSC) for designation of unique streams in Region H for the revised 2006 Water Plan.

The HSC supports the present unique stream designations for Armand Bayou, Harris County; Bastrop Bayou, Brazoria County; Big Creek, Fort Bend County; Big Creek, San Jacinto County; Cedar Lake Creek, Brazoria County; and Menard Creek, Liberty, Hardin, and Polk Counties.

The HSC supports the list of recommended unique streams that Texas Parks and Wildlife Department has provided to Region H.

The HSC recommends the designation of the following stream segments as unique streams:

1) The portion of Winters Bayou that flows from FM 1375 to East Fork of San Jacinto River, 26 miles, through Sam Houston National Forest (SHNF). The U.S. Forest Service (FS) has determined that this segment of Winters Bayou qualifies for inclusion in the Wild and Scenic River System as a Recreational River.

2) The Henry Lake Branch that flows 10.5 miles through SHNF and merges with Double Lake Branch in the Big Creek Scenic Area. The FS has determined that Henry Lake Branch qualified for inclusion in the Wild and Scenic River System as a Recreational River.

3) The portion of the East Fork of the San Jacinto River that flows through the boundaries of SHNF.

4) The portion of Briar Creek that flows through the boundaries of SHNF.

5) The portion of Boswell Creek that flows through the boundaries of SHNF.

6) The portion of Harman Creek that flows through the boundaries of SHNF.

7) The portion of East Sandy Creek that flows through the boundaries of SHNF.

8) The portion of West Sandy Creek that flows through the boundaries of SHNF.

9) The portion of the West Fork of the San Jacinto River that flows through the boundaries of SHNF.

10) The portion of Caney Creek that flows through the boundaries of SHNF.

11) The portion of Little Lake Creek that flows through the boundaries of SHNF.

12) Lone Oak Bayou.

13) The portion of Oyster Bayou that flows through the boundaries of the Anahuac National Wildlife Refuge.

14) The portion of the Trinity River, Old River, and Lost River that flows through the boundaries of the Corps of Engineers Wallisville Dam area.

15) The portion of East Bay Bayou that flows through the boundaries of Anahuac National Wildlife Refuge.

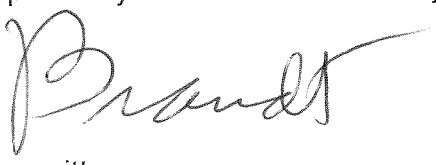
16) The portion of Onion Bayou that flows through the boundaries of Anahuac National Wildlife Refuge.

17) The portion of the Trinity River that flows through the boundaries of the Trinity River Wildlife Refuge.

18) The portion of the Brazos River that flow through Stephan F. Austin and Brazos Bend State Parks.

We appreciate this opportunity to comment. Thank you.

Sincerely,



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March 28, 2005

Mr. Jim Adams
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Region H Water Planning Group
General Manager
San Jacinto River Authority
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and

Mr. Andrew A. Sterbenz
Project Manager, Infrastructure
KBR
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Dear Jim and Andrew,

Enclosed are the comments of the Houston Regional Group of the Sierra Club (Sierra Club) regarding the draft of Chapter 5 of the Region H Water Plan, Impacts of Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas, and other documents that we received at the March 1, 2005 Region H Water Planning Group (RHWPG) meeting.

1) There was not page 5-1 in the handout that the HSC received.

2) **On page 5-2, 5.1 Scope of Work,** it is not the HSC's view, and it certainly does not fit the definition in the dictionary of "consensus" (The Random House Dictionary of the English Language, College Edition, "harmony") that this planning effort is "consensus-based".

It appears to the HSC that environmental organizations are not in "general agreement" with the water management strategies and their alternatives that have been approved to date by the RHWPG.

It appears that there has been a lack of environmental analysis that has been conducted on the water management strategies and their alternatives.

It appears that the mechanism for public input does not allow sufficient time for review and comment on documents handed out at the RHWPG public meeting before the decisions are made on those documents. At the March 1, 2005 public meeting approximately 235 pages of material was handed out which the public had to read, digest, and comment on within 5 minutes after the meeting began. This is not possible or fair.

3) **On pages 5-2, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality,** the phrases "non-conservative substances" and "conservative substances" are used. What do these phrases mean? The general public will not know what these phrases mean. The RHWP should use terms that the public can easily understand.

4) **On page 5-3, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality,** Chapter 5 states "This 2006 Region H Plan recommends a saltwater barrier be added above the Brazos estuary to protect water quality in that reach of the Brazos River as well". The water quality that will be protected will be "freshwater" from additional salt levels. There is no discussion about whether the saltwater migration up the river has been assisted or exacerbated by human activities and if so how much has been caused by human activities (for example freshwater inflow reductions and river channel widening and deepening). Since the Brazos River estuary is within the river itself the impacts on the reduction of this estuary by reducing the linear length of saltwater is an important question for the RHWPG to consider.

5) **On page 5-3, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality,** Chapter 5 states "The Brazos River alluvium has the greatest communication with surface supplied". To make this thought more understandable to the public restate to say that river water recharges the aquifer recharge zone.

6) **On page 5-4, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality,** Chapter 5 states "the thickness of the near-surface clay sols located over much of the Region provide an effective barrier to deeper aquifer contamination due to normal infiltration". Is this statement accurate for the recharge areas for the Evangeline and Chicot Aquifers in the Sam Houston National Forest area? There is a preponderance of more sandy and or silty soils in Sam Houston National Forest. Since this area is a part of the major recharge area for these two aquifers the HSC has a concern that the mentioned "near-surface clay soils" are not adequately located in all such areas.

7) **On page 5-6, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality,** regarding the new contracts from existing supplies, including the Houston to GCWA transfer contractual transfers and the

TRA, there should be discuss about how much return flows via wastewater treatment facility will provide "some mitigation" for "in-stream dilution".

8) **On page 5-6, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality,** regarding the Luce Bayou Interbasin Transfer, Chapter 5 states "Additionally, the transfer will potentially reduce flow in the Trinity River below Dayton". How much will the flow be reduced? What environmental impacts will this have? This should be discussed.

9) **On page 5-6, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality,** regarding the Wastewater Reuse by Houston, by NRCRWA, and by Ship-Channel Industry, Chapter 5 states "In the case of industrial reuse, the reverse-osmosis discharge water would be injected into the bottom of the Houston Channel, into an already brackish zone". Where is this brackish zone? How deep is it? Will there be any leakage back into the Houston Ship Channel? This issue needs to be discussed.

10) **On page 5-7, 5.3 Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs,** Chapter 5 states "Other water bodies similarly provide economic opportunities in recreation support activities. The report does not state that economic recreational activities can also degrade water quality.

11) **On page 5-7, 5.3 Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs, Table 5-1: Recreational Activities Associated with Water in Region H,** under Major Sensitivity to Supply column, aesthetics should be added to the activities of Boating, Swimming, and Hunting. Instream flow should be added to Parks, Hunting, and Swimming.

12) **On page 5-8, 5.3 Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs,** Chapter 5 states "The future sedimentation condition benefits downstream projects, because upper basin projects have less capacity to store available flows". Will this condition remain the same throughout the entire 2060 period? How will Lakes Houston and Livingston be affected by sedimentation storage and capacity reduction? This issue should be discussed.

13) **On page 5-9, Table 5-2: Lake Level Percentile Tables,** the information is not meaningful to the public because it is not in a form that can be adequately understood. For instance, in addition to the information provided it would provide a better and more visually understandable picture if the percent acreage when full and at various degrees of emptiness is given (maximum, 90^{th}, 75^{th}, median, 25^{th}, 10^{th}, and minimum) or how many acre-feet exist at these various levels of emptiness so that the public can compare the differences in more understandable measures.

14) Appendix 5A, there appears to be little water quality sampling on the upper watershed of the San Jacinto River. The HSC encourages the RHWPG to urge

the TCEQ and TWDB to fund and or commit to additional sampling. It is very important that the quality of water from the springheads and other sources of beginning of the San Jacinto River is determined on a continuous basis. This will ensure that if water quality deteriorates that an early warning system is in place to determine this and correct it as soon as possible.

Discuss Legislative Issues

1) **On page 8, Environmental Category – Highly Ranked Items,** the importance that sustainable growth, including impacts of growth, elicits directly connects to the concerns that the HSC has for population and development growth that we have brought before this RHWPG. These issues need to be addressed and if the RHWPG is not the right forum then it needs to take the responsibility to refer these concerns to the right forum so that they can be addressed.

Consultants Report, March 1, 2005

1) **On page 5, Impacts on Water Quality,** the HSC is hard pressed to believe that the water management strategies have "No major water quality impacts identified". Certainly the increase in water availability will fuel both population and development growth which will increase both the number and or size of sewage treatment plants and will increase non-point source water pollution run-off from paved areas and other sources. There currently is no good assessment for how well non-point source water pollution plans are being implemented and will continue to be implemented in the future. Since there are too few investigators already to cover current sewage treatment plants for water quality monitoring it must be assumed that a similar situation will occur for non-point source water pollution and the plans implemented for its reduction. If few are monitoring, auditing, and checking compliance how good will compliance be?

2) **On page 5, Impacts on Water Quality,** the report states that "Water conservation measures may reduce minimum instream flows. What effect will this have on the concentration of water pollutants?

3) **On page 6, Impacts on Water Quality,** the report states that "Luce Bayou IBT will potentially improve the quality of Lake Houston but decrease flows in the Trinity River below Dayton". What impacts will this have on the Wallisville Area, Lakes Charlotte, Mud, Miller, and Mac, Old and Lost Rivers, the bottomland hardwoods, cypress swamps, and floodplain forests, other wetland vegetation, Trinity Bay (Will it be made more salty and more vulnerable to oyster predators (like the oyster drill – Thais) and diseases?). These questions need to be answered or at least addressed in the Region H Water Plan.

4) **On page 6, Impacts on Water Quality,** one of the things that David mentioned is that the latest studies show no clear-cut way to get streams into

compliance with bacteria standards. This is of concern since many streams are supposed to meet fishable and swimmable standards. The Region H Water Plan should make a recommendation that the TCEQ and or TWDB focus on how to meet the bacteria standards.

5) **On pages 6-7, Third Party Impacts of Reduced Lake Levels,** this information needs to be put into a different form to have meaning for the public. There are at least two ways to do this. Give the surface area of the lake in acres and then tell what percent of this will be dry during the different elevation levels provided. Or give the number of acres that will be dry for each elevation level provided. People cannot picture in their minds what 199.3 feet means in Lake Conroe or43.6 feet means for Lake Houston or 131 feet means for Lake Livingston. People can understand and picture better percentages and acres. In addition, there is no information about the amount of sedimentation that will occur during the Region H Water Plan time period (2060) and what impact this will have on lake levels and water capacity. This information should be added to the RHWP.

6) **On page 8, Impacts of Moving Water from Rural/Agriculture Areas,** the RHWP should include information about the difference in water savings (due to leaks and evaporation) between pipelines and open ditches.

7) **On page 11, Brazos Saltwater Barrier Recommendations,** the environmental impacts to the Brazos River Estuary (including area losses) in all years, with and without the saltwater barrier, should be estimated.

8) **On page 12, Embedded Strategies,** the RHWP should contain more and better information about the possibilities and amounts of water that can be conserved via industrial water conservation.

9) **On page 12, Brazos G Strategies,** it is not clear what the environmental impacts are due to off-channel reservoirs. This must be clarified in the RHWP. The HSC supports RHWPG member Bartos when he voted against putting the Little River off-channel reservoir in the RHWP because there was no technical review memorandum. The members of the RHWPG should not vote in favor of items that they have no information about. This does not serve the public interest and does not make for informed decisions.

10) **On page 18, Alternate Strategies,** the HSC does not support the addition of alternative strategies to the RHWP. As stated by the TWDB representative, at present, there is no call for these in the plan and that legislative action may be required to allow them to be a formal part of the plan.

In particular the HSC is opposed to the East Texas transfer since it will be very expansive and have a tremendous impact on the environment of Regions I and H as well as Sam Houston National Forest and Big Thicket National Preserve. We

also oppose Bedias since it will have negative impacts on Sam Houston National Forest and the West Form of the San Jacinto River bottomland hardwoods. The HSC also does not know what the "alternative Brazos Basin Reservoirs are that are mentioned since they are not specifically named on page 18.

The HSC agrees with RHWPG member Bartos that if everything is included in the RHWP then why call it a plan. It is highly enlightening that although only two months ago representatives of both the San Jacinto River Authority and the City of Houston both said that they did not want their agencies' names linked to the East Texas water transfer strategy that both voted for this "alternative strategy" and both said that it was needed.

It is also of concern to the HSC that the RHWPG appears to want to avoid public notice for important and significant amendments to the RHWP and that this is predicated on reducing costs. The real effect of implementing this will be a reduction in public participation since fewer people will be aware of the opportunity to comment at a RHWPG meeting if there is no public notice and hearing.

11) **On pages 19-22, Unique Streams,** it concerns the HSC that some members of the RHWPG at the March meeting questioned why there was a need to designate unique streams including the ones that were designated in the 2001 Plan. The HSC supports unique stream designation including additional segments for the 2006 Plan that we have submitted to RHWPG.

Region H Water Management Strategy Analysis Technical Memorandum for Brazos Saltwater Barrier

1) **On page 1,** the memorandum does not discuss how much of the instream Brazos River estuary will be affected and what these affects will be.

2) **On page 4,** the memorandum does not discuss how much of the saltwater migration upstream is due to human impacts like the reduction in freshwater flow and the deepening of the Brazos River and its tributaries for navigation.

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whether the alternative that was not considered "The option of releasing stored water from the upper Brazos" (page 14) is in fact a reasonably alternative.

Region H Water Management Strategy Analysis Technical memorandum for East Texas Water Transfer

1) **On page 1,** the total cost that is reported as more than one-half billion dollars is probably an underestimate because environmental costs, maintenance costs, and the typical rise in construction costs for large projects have not been factored in. For example, the expansion of the Katy Freeway in the Houston Area doubled when the actual work started.

2) **On page 1,** the suggestion that we need 486,500 acre-feet of water from this project by 2060 has been documented and firmly contradicted by the consultant's work which shows that other water strategies that have been approved by the RHWPG are more cost effective and will provide the water Region H needs through 2060. The East Texas Water Transfer water strategy is an unneeded strategy and scored among the poorest on the matrix that the consultants created and completed. This is an unneeded and unnecessary project that the HSC opposes.

3) **On page 2,** the memorandum states, "With East Texas water supplies to replenish the lower Trinity water, additional withdrawals of Trinity water can be made from lake Livingston." What additional impacts will occur to recreation due to these additional withdrawals?

4) **On page 2,** the memorandum states, "An integral part of this strategy is a pipeline from Lake Livingston discharging into the West Fork of the San Jacinto River ... This segment ultimately flows into Lake Conroe and then diverted to meet demands throughout the San Jacinto River basin". This proposal will have impacts on Sam Houston National Forest, bottomland hardwood forested wetlands that exist on the West Fork of the San Jacinto River, and recreation including canoeing on the West Fork of the San Jacinto River.

5) **On page 2,** the memorandum states, "Ultimately, as much as 486,000 acre-feet per year of East Texas water will be required to meet shortages. Sufficient supplies of water exist in the Sabine and niches River watersheds to satisfy all of these demands". This assumes all other water strategies will not work. But the consultants have documented that the East Texas water transfer water strategy is one of the worst scoring strategies.

6) **On page 2,** the memorandum states, "Facilities were sized to account for anal losses (assumed to be 85 acre-feet per year per canal mile) plus 20% for seasonal variations". What do these canal losses total to for a typical year? What is the total length of the pipelines and or canals? The public should be told so it understands how much water will be lost.

7) **On page 3,** the maintenance costs are not mentioned. What will the maintenance costs be?

8) **On page 3,** the impacts that the proposal will have on Big Thicket National Preserve, both direct and indirect, as well as cumulative are not discussed and must be to give the RHWPG and the public information about this significant environmental cost.

9) **On page 3,** the memorandum states, "Additionally, this cost includes no estimate for upgrades to existing conveyances required that would deliver Sabine or Neches River water from the Trinity and San Jacinto Rivers to customers". The full costs of the East Texas water transfer strategy have not been computed and should be so the RHWPG and the public can review and comment on these.

10) **On page 4, Issues and Considerations,** there is no discussion that Region I and Region H have made no decision with regard to the water that the East Texas water transfer strategy will use. Fish and wildlife impacts are also an issue that needs to be considered and evaluated and the costs provided to the RHWPG and the public for review and comment.

11) **On page 6,** the monthly inflow target percent compliance for maximum C, Minimum Qsal, and Minimum Q are low (29% to 66%) and not encouraging.

12) **On page 6,** the memorandum states, "Rectification of some segment of the river (West Fork of the San Jacinto River) may be required". The HSC is opposed to any rectification (channelization) of the West Fork, whether in SHNF or not, and the additional impacts that will occur due to this water transfer.

13) **On page 6,** the memorandum states, "Increased use of stored water from lake Livingston may result in periodic or prolonged low lake levels, which may adversely impact property values and recreational revenues in Walker, Trinity, San Jacinto and Polk Counties". The estimated costs of these impacts should be provided for RHWPG and public to review and comment.

Region H Water Management Strategy Analysis Technical Memorandum for Allens Creek Reservoir

1) **On page 2,** the memorandum states, "Delivery to downstream customers using the bed and banks of the Brazos River would require a subsequent permit". The environmental impacts of such a strategy should be clearly documented so that the RHWPG and public can review and comment.

2) **On page 2,** Alligator Hole is mentioned as an important wetlands. What impact will the Allens Creek Dam project have on this wetlands? The RHWPG and the public needs this information so that they can review and comment.

Region H Water Management Strategy Analysis Technical Memorandum for Municipal Water Conservation

1) The HSC supports municipal water conservation and maximum implementation of this water strategy.

2) **On page 6, Results,** the HSC supports a stronger and more stringent water conservation program for WUGs with populations with less than 3,301 and between 3,300 and 10,001.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt Mannchen

Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, Texas 77096
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April 19, 2005

Mr. Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, TX 77096

Subject: Response to Comments on Draft Chapters 5 of the 2006 Region H Regional Water Plan and other document received at the March 1, 2005 RHWPG Meeting.

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input to draft Chapter 5 of the Region H Water Plan, Impacts of Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas, and other documents that received at the March 1, 2005 Region H Water Planning Group (RHWPG) meeting for the 2006 Regional Water Plan. The following letter provides responses to the comments you provided in your letter dated March 28, 2005.

We would like to make one distinction at the beginning of this response. Your letter addresses both the draft report chapters and the presentation materials used at the meeting. While you are welcome to comment on both, please understand that some of the presentation materials were intended to guide the Planning Group discussion, and do not reflect the decisions made at the meeting. For example, you address the East Texas Transfer Water Management Strategy as if it were included in the Region H plan. It appears on the slides as a discussion topic, but was not recommended as a management strategy, nor was it selected to appear as a viable alternative in the report.

Response to Comments on Chapter 5

1) There was not page 5-1 in the handout that the HSC received.

Comment Noted and Page Numbering will be corrected.

2) On page 5-2, 5.1 Scope of Work, it is not the HSC's view, and it certainly does not fit the definition in the dictionary of "consensus" (The Random House Dictionary of the English Language, College Edition, "harmony") that this planning effort is "consensus-based".

It appears to the HSC that environmental organizations are not in "general agreement" with the water management strategies and their alternatives that have been approved to date by the RHWPG.

It appears that there has been a lack of environmental analysis that has been conducted on the water management strategies and their alternatives.

It appears that the mechanism for public input does not allow sufficient time for review and comment on documents handed out at the RHWPG public meeting before the decisions are made on those documents. At the March 1, 2005 public meeting approximately 235 pages of material was handed out which the

public had to read, digest, and comment on within 5 minutes after the meeting began. This is not possible or fair.

Comment Noted – According to the New College Edition, The American Heritage Dictionary of the English Language, the definition of "consensus" is "collective opinion" or "general agreement". The regional water planning group is composed of members to represent interests in regional water planning. The group is not always in complete agreement, but planning guidelines dictate that a majority of the vote is needed to collectively agree.

Chapters distributed at a Region H meeting remain open for comments for two successive meetings. This is discussed on the report timeline at the beginning of each meeting.

3) On pages 5-2, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, the phrases "non-conservative substances" and "conservative substances" are used. What do these phrases mean? The general public will not know what these phrases mean. The RHWP should use terms that the public can easily understand.

Comment Noted – Clarification as to the definition of conservative and non-conservative substances will be added to this section. Conservative substances are those that do not undergo rapid degradation or do not change in water as the substance flows downstream (e.g., metals). Non-conservative substances are those that do undergo rapid degradation or change as the substance moves downstream (e.g., some organic substances).

4) On page 5-3, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, Chapter 5 states "This 2006 Region H Plan recommends a saltwater barrier be added above the Brazos estuary to protect water quality in that reach of the Brazos River as well". The water quality that will be protected will be "freshwater" from additional salt levels. There is no discussion about whether the saltwater migration up the river has been assisted or exacerbated by human activities and if so how much has been caused by human activities (for example freshwater inflow reductions and river channel widening and deepening). Since the Brazos River estuary is within the river itself the impacts on the reduction of this estuary by reducing the linear length of saltwater is an important question for the RHWPG to consider.

Comment Noted – No Changes recommended to the text. The technical memorandum cites the 2004 TWDB study on the impacts of the Allens Creek Reservoir on downstream water rights. That report shows the increase in the salt wedge migration due to full use of water rights, under both normal and drought conditions. That report underscored the need for a physical barrier.

5) On page 5-3, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, Chapter 5 states "The Brazos River alluvium has the greatest communication with surface supplied". To make this thought more understandable to the public restate to say that river water recharges the aquifer recharge zone.

Comment noted – Text will be revised to state "The Brazos River alluvium is directly recharged from the base flow in the Brazos River."

6) On page 5-4, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, Chapter 5 states "the thickness of the near-surface clay soils located over much of the Region provide an effective barrier to deeper aquifer contamination due to normal infiltration". Is this statement accurate

for the recharge areas for the Evangeline and Chicot Aquifers in the Sam Houston National Forest area? There is a preponderance of more sandy and or silty soils in Sam Houston National Forest. Since this area is a part of the major recharge area for these two aquifers the HSC has a concern that the mentioned "near-surface clay soils" are not adequately located in all such areas.

Comment noted – The text does not specify that "all" of Region H has near-surface clay soils.

7) On page 5-6, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, regarding the new contracts from existing supplies, including the Houston to GCWA transfer contractual transfers and the TRA, there should be discuss about how much return flows via wastewater treatment facility will provide "some mitigation" for "in-stream dilution".

Comment Noted – A sentence will be added stating that typical municipal use return flows are 60 percent of the total quantity diverted for use. Use of transferred supply will increase the total return flow to the San Jacinto and San Jacinto-Brazos basins. It is this increased flow which will dilute non-point source (run-off) contaminants.

8) On page 5-6, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, regarding the Luce Bayou Interbasin Transfer, Chapter 5 states "Additionally, the transfer will potentially reduce flow in the Trinity River below Dayton". How much will the flow be reduced? What environmental impacts will this have? This should be discussed.

The flow in the river will be reduced by the transfer amount, minus releases made from storage to supply the diversion. Currently, the Lake Livingston water rights are not fully utilized, and the unused supply remains in the river. This transfer will reduce inflows to Trinity Bay, as discussed in Chapters 4 and 7. However, the Wallisville Saltwater Barrier will prevent severe water quality changes due to brackish influence in the lower basin. A sentence clarifying this will be added into Chapter 5.

9) On page 5-6, 5.2 Impacts of Water Management Strategies of Key Parameters of Water Quality, regarding the Wastewater Reuse by Houston, by NRCRWA, and by Ship-Channel Industry, Chapter 5 states "In the case of industrial reuse, the reverse-osmosis discharge water would be injected into the bottom of the Houston Channel, into an already brackish zone". Where is this brackish zone? How deep is it? Will there be any leakage back into the Houston Ship Channel? This issue needs to be discussed.

The Houston Ship Channel is dredged to a depth of 45-feet, which is five times the depth of Galveston Bay. Water within the channel is stratified, with fresh water flowing to the bay at the top and seawater returning on the tides at the bottom. A mixing zone exists at mid-depth, the location fluctuating due to tides and outflow volumes. Discharging the brine from the reverse osmosis process into the seawater layer below the mixing zone reduces impacts on the upper layer. The brine would form a mixing layer at the bottom of the channel, blending with the seawater layer.

10) On page 5-7, 5.3 Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs, Chapter 5 states "Other water bodies similarly provide economic opportunities in recreation support activities. The report does not state that economic recreational activities can also degrade water quality.

That is correct; the report does not state that. The Region H RWPG is not aware of a particular study relating recreational activities to water quality degradation for water supply reservoirs in the Region H planning area.

11) On page 5-7, 5.3 Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs, Table 5-1: Recreational Activities Associated with Water in Region H, under Major Sensitivity to Supply column, aesthetics should be added to the activities of Boating, Swimming, and Hunting. Instream flow should be added to Parks, Hunting, and Swimming.

The table will be updated to reflect your suggestions.

12) On page 5-8, 5.3 Evaluation of Third-Party Impacts of Reduced Levels in Water Supply Reservoirs, Chapter 5 states "The future sedimentation condition benefits downstream projects, because upper basin projects have less capacity to store available flows". Will this condition remain the same throughout the entire 2060 period? How will Lakes Houston and Livingston be affected by sedimentation storage and capacity reduction? This issue should be discussed.

Sedimentation is the gradual process of suspended solids (usually soil particles) collecting at the bottom of reservoirs over a period of years. This occurs because reservoirs reduce the velocity of water passing through them, and a high velocity is required to hold these soils in suspension. Without the reservoir, the soils would be carried downstream and deposited in a coastal river delta. In the model, the reservoir storage volume is reduced based on estimated sedimentation over time. The reservoir storage will continue to decline over time unless a removal program is initiated. This is briefly discussed in Chapter 3.3, but an expanded discussion will be added in that section.

13) On page 5-9, Table 5-2: Lake Level Percentile Tables, the information is not meaningful to the public because it is not in a form that can be adequately understood. For instance, in addition to the information provided it would provide a better and more visually understandable picture if the percent acreage when full and at various degrees of emptiness is given (maximum, 90th, 75th, median, 25th, 10th, and minimum) or how many acre-feet exist at these various levels of emptiness so that the public can compare the differences in more understandable measures.

Detailed graphs and tables are provided in Appendix 5B of the chapter, but the text in Chapter 5 will be expanded to better explain the water level – surface area – storage volume relationship for the three lakes.

14) Appendix 5A, there appears to be little water quality sampling on the upper watershed of the San Jacinto River. The HSC encourages the RHWPG to urge the TCEQ and TWDB to fund and or commit to additional sampling. It is very important that the quality of water from the springheads and other sources of beginning of the San Jacinto River is determined on a continuous basis. This will ensure that if water quality deteriorates that an early warning system is in place to determine this and correct it as soon as possible.

Comment noted – No action will be taken to modify text.

Comments on Legislative Issues

1) On page 8, Environmental Category - Highly Ranked Items, the importance that sustainable growth, including impacts of growth, elicits directly connects to the concerns that the HSC has for population and development growth that we have brought before this RHWPG. These issues need to be addressed and if the RHWPG is not the right forum then it needs to take the responsibility to refer these concerns to the right forum so that they can be addressed.

Comment noted – The HSC's comment letters will be included in Chapter 10 of the final report. However, the HSC is encouraged to submit their questions about the population projections directly to the TWDB and the Texas Legislature.

Comments on Consultants Report, March 1, 2005

1) On page 5, Impacts on Water Quality, the HSC is hard pressed to believe that the water management strategies have "No major water quality impacts identified". Certainly the increase in water availability will fuel both population and development growth which will increase both the number and or size of sewage treatment plants and will increase non-point source water pollution run-off from paved areas and other sources. There currently is no good assessment for how well non-point source water pollution plans are being implemented and will continue to be implemented in the future. Since there are too few investigators already to cover current sewage treatment plants for water quality monitoring it must be assumed that a similar situation will occur for non-point source water pollution and the plans implemented for its reduction. If few are monitoring, auditing, and checking compliance how good will compliance be?

The State and Federal standards for wastewater and storm water discharges have become more stringent in recent years, with sampling required at greater frequencies. While there may be facilities that fail to meet their discharge standards, there is nothing inherent in the recommended water management strategies that would cause facilities to fail to meet these standards.

2) On page 5, Impacts on Water Quality, the report states that "Water conservation measures may reduce minimum instream flows. What effect will this have on the concentration of water pollutants?

It depends on the type of water conservation measures being performed and the pollutant of interest. In general, water conservation will most-likely reduce instream flows that are composed of wastewater discharges, but this should be mitigated by diverting less water from the source stream or reservoir. If conservation is performed year round, then the impact on instream flows during wet years should have a beneficial impact by passing more flow by the diversion points, thus reducing the concentration of water pollutants.

3) On page 6, Impacts on Water Quality, the report states that "Luce Bayou IBT will potentially improve the quality of Lake Houston but decrease flows in the Trinity River below Dayton". What impacts will this have on the Wallisville Area, Lakes Charlotte, Mud, Miller, and Mac, Old and Lost Rivers, the bottomland hardwoods, cypress swamps, and floodplain forests, other wetland vegetation, Trinity Bay (Will it be made more salty and more vulnerable to oyster predators (like the oyster drill - Thais) and diseases?). These questions need to be answered or at least addressed in the Region H Water Plan.

As stated in that same paragraph, the Wallisville Saltwater Barrier will protect the lower Trinity River from an increase in salinity. The Trinity Bay will see a reduction in freshwater inflows, but the extent of that reduction is dependent upon the Region C strategies, which could reduce or increase flows above Lake Livingston, depending upon the amount of reuse recommended..

4) On page 6, Impacts on Water Quality, one of the things that David mentioned is that the latest studies show no clear-cut way to get streams into compliance with bacteria standards. This is of concern since many streams are supposed to meet fishable and swimmable standards. The Region H Water Plan should make a recommendation that the TCEQ and or TWDB focus on how to meet the bacteria standards.

Comment noted

5) On pages 6-7, Third Party Impacts of Reduced Lake Levels, this information needs to be put into a different form to have meaning for the public. There are at least two ways to do this. Give the surface area of the lake in acres and then tell what percent of this will be dry during the different elevation levels provided. Or give the number of acres that will be dry for each elevation level provided. People cannot picture in their minds what 199.3 feet means in Lake Conroe or 43.6 feet means for Lake Houston or 131 feet means for Lake Livingston. People can understand and picture better percentages and acres. In addition, there is no information about the amount of sedimentation that will occur during the Region H Water Plan time period (2060) and what impact this will have on lake levels and water capacity. This information should be added to the RHWP.

Chapter 5 will be updated per your earlier comment on this topic.

6) On page 8, Impacts of Moving Water from Rural/Agriculture Areas, the RHWP should include information about the difference in water savings (due to leaks and evaporation) between pipelines and open ditches.

This is addressed in the Irrigation Conservation water management strategy technical memorandum, in Appendix B to Chapter 4. The purpose of this portion of Chapter 5 is to discuss the impacts of the plan on agriculture, not the impacts of agriculture on water use.

7) On page 11, Brazos Saltwater Barrier Recommendations, the environmental impacts to the Brazos River Estuary (including area losses) in all years, with and without the saltwater barrier, should be estimated.

See the response to this question in the technical memorandum section, below.

8) On page 12, Embedded Strategies, the RHWP should contain more and better information about the possibilities and amounts of water that can be conserved via industrial water conservation.

Comment Noted - The planning group also supports conservation. The difficulty is in quantifying the cost and water savings across the diversity of industries so that it may be applied to the region as a whole and entered into the planning database. Similar to the recommended Industrial Reuse Strategy for ship channel industries sponsored by the City of Houston, additional industrial conservation strategies and resulting savings will be incorporated in subsequent regional plans as specific entities develop these plans.

9) On page 12, Brazos G Strategies, it is not clear what the environmental impacts are due to off-channel reservoirs. This must be clarified in the RHWP. The HSC supports RHWPG member Bartos when he voted against putting the Little River off-channel reservoir in the RHWP because there was no technical review memorandum. The members of the RHWPG should not vote in favor of items that they have no information about. This does not serve the public interest and does not make for informed decisions.

The concerns raised about the Little River Off-Channel Reservoir are addressed in the draft Chapter 4, distributed on March 23, 2005. The RHWPG agreed to table the decision on that project until they had reviewed the technical materials.

10)(1) On page 18, Alternate Strategies, the HSC does not support the addition of alternative strategies to the RHWP. As stated by the TWDB representative, at present, there is no call for these in the plan and that legislative action may be required to allow them to be a formal part of the plan.

Comment Noted – The designation of Alternative Management Strategies in the Region H plan identifies those strategies considered feasible but not required in the current plan. These will not be included in the state water plan unless a new rule is implemented recognizing alternative strategies in the regional plans.

10)(2) In particular the HSC is opposed to the East Texas transfer since it will be very expansive and have a tremendous impact on the environment of Regions I and H as well as Sam Houston National Forest and Big Thicket National Preserve. We also oppose Bedias since it will have negative impacts on Sam Houston National Forest and the West Form of the San Jacinto River bottomland hardwoods. The HSC also does not know what the "alternative Brazos Basin Reservoirs are that are mentioned since they are not specifically named on page 18.

Comments Noted

10)(3) The HSC agrees with RHWPG member Bartos that if everything is included in the RHWP then why call it a plan. It is highly enlightening that although only two months ago representatives of both the San Jacinto River Authority and the City of Houston both said that they did not want their agencies' names linked to the East Texas water transfer strategy that both voted for this "alternative strategy" and both said that it was needed.

The East Texas Transfer Management Strategy was not selected by the RHWPG as an alternative strategy. You are basing this comment on the presentation slide, which listed the transfer as a potential alternative, and not on the actual alternatives selected by the RHWPG.

10)(4) It is also of concern to the HSC that the RHWPG appears to want to avoid public notice for important and significant amendments to the RHWP and that this is predicated on reducing costs. The real effect of implementing this will be a reduction in public participation since fewer people will be aware of the opportunity to comment at a RHWPG meeting if there is no public notice and hearing.

The discussion at the meeting was on a proposal by the TWDB to allow the inclusion of alternate strategies in Regional Water Plans. Under that proposal, a Planning Group would fully evaluate all potential water management strategies, recommend those that best met the needs of the region, and also recommend those alternate strategies that were viable but not required by the region during the planning period. Only supply from recommended strategies would be allocated to water user groups. If one of the recommended strategies later proved unfeasible, the planning group would be allowed to remove a recommended strategy and replace it with an alternative. The notice for such a change would be less than for a full plan amendment. This change would be subject to TWDB review and approval.

This proposal by the TWDB has not been approved by the Legislature, and will not affect the current planning rules. If a rule change is made in the future, alternate strategies will formally be included in either the next update to the Regional Water Plan, or in an amendment to this plan.

11) On pages 19-22, Unique Streams, it concerns the HSC that some members of the RHWPG at the March meeting questioned why there was a need to designate unique streams including the ones that were designated in the 2001 Plan. The HSC supports unique stream designation including additional segments for the 2006 Plan that we have submitted to RHWPG.

Comment noted.

Region H Water Management Strategy Analysis Technical Memorandum for Brazos Saltwater Barrier

1) On page 1, the memorandum does not discuss how much of the instream Brazos River estuary will be affected and what these affects will be.

Page 12 of the technical memorandum points out that the Brazos River estuary is one of the smallest and least productive in the state. An estuary is defined as a mixing region of fresh and sea water. As you know, estuary habitat is dependent upon this brackish mix of salinities, and also upon light reaching the bottom of the water column. The Brazos River is deep (upwards of 30-feet) and carries a heavy sediment load, preventing the passage of light and the formation of productive habitat. A detailed siting study will be required to ensure a saltwater barrier does not isolate estuary habitat from the seawater influence.

2) On page 4, the memorandum does not discuss how much of the saltwater migration upstream is due to human impacts like the reduction in freshwater flow and the deepening of the Brazos River and its tributaries for navigation.

The current migration is due to a mix of rainfall conditions and upstream diversions. The Brazos has not been modified for navigation above Freeport, and the most significant modification was the construction of the Intracoastal Waterway near the mouth of the channel. The report discussed on page 5 addresses the anticipated decrease in streamflows due to full use of existing water rights.

3) On page 7, although 500 ppm is the desired limit for salinity this memorandum should also make an assessment on a salinity level of 750 ppm and 1,000 ppm which are also acceptable salinity levels so there is a range of alternatives for the saltwater barrier.

500 ppm was used as an average condition planning target, so that seasonal fluctuations would not exceed 1,000 ppm. Calculated estimates of peak salinities at the Harris intake exceeded 26,000 ppm in this study, so the distinction between 500 ppm and 1,000 ppm is not significant.

4) On page 13, Table 2, the memorandum does not provide the maintenance costs for the saltwater barrier. These are costs that should be included in this document because they are long-term costs that an entity commits to when it agrees to pay for and operate the saltwater barrier. In addition the positive environmental costs of guaranteed water flows for instream and bay and estuary purposes should be discussed and estimated. Then the reader could decide whether the alternative that was not considered "The option of releasing stored water from the upper Brazos" (page 14) is in fact a reasonably alternative.

Table 2 reflects capital costs, and is correct. Table 3, Net Present Value, should reflect the capital plus the O&M costs, and will be updated. The overall assessment that using the Harris Reservoir diversion point is the least costly remains unchanged.

Within the planning period, all identified Brazos River supplies are fully utilized. Therefore, any releases made to reduce the affects of the salt wedge would require an additional water supply project (such as a reservoir) to meet this demand. The cost of that supply would exceed the current BRA system rate used in this analysis.

Region H Water Management Strategy Analysis Technical memorandum for East Texas Water Transfer

All comments below regarding the East Texas Transfer of water to Region H have been noted. The East Texas Water Transfer Strategy is not recommended as a primary or alternate strategy for the 2006 Region H Regional Water Plan. Therefore, a detailed response to the comments provided below are not provided.

1) On page 1, the total cost that is reported as more than one-half billion dollars is probably an underestimate because environmental costs, maintenance costs, and the typical rise in construction costs for large projects have not been factored in. For example, the expansion of the Katy Freeway in the Houston Area doubled when the actual work started.

2) On page 1, the suggestion that we need 486,500 acre-feet of water from this project by 2060 has been documented and firmly contradicted by the consultant's work which shows that other water strategies that have been approved by the RHWPG are more cost effective and will provide the water Region H needs through 2060. The East Texas Water Transfer water strategy is an unneeded strategy and scored among the poorest on the matrix that the consultants created and completed. This is an unneeded and unnecessary project that the HSC opposes.

3) On page 2, the memorandum states, "With East Texas water supplies to replenish the lower Trinity water, additional withdrawals of Trinity water can be made from Lake Livingston." What additional impacts will occur to recreation due to these additional withdrawals?

4) On page 2, the memorandum states, "An integral part of this strategy is a pipeline from Lake Livingston discharging into the West Fork of the San Jacinto River ... This segment ultimately flows into Lake Conroe and then diverted to meet demands throughout the San Jacinto River basin". This proposal will have impacts on Sam Houston National Forest, bottomland hardwood forested wetlands that exist on the West Fork of the San Jacinto River, and recreation including canoeing on the West Fork of the San Jacinto River.

5) On page 2, the memorandum states, "Ultimately, as much as 486,000 acre-feet per year of East Texas water will be required to meet shortages. Sufficient supplies of water exist in the Sabine and niches River watersheds to satisfy all of these demands". This assumes all other water strategies will not work. But the consultants have documented that the East Texas water transfer water strategy is one of the worst scoring strategies.

6) On page 2, the memorandum states, "Facilities were sized to account for anal losses (assumed to be 85 acre-feet per year per canal mile) plus 20% for seasonal variations". What do these canal losses total to for a typical year? What is the total length of the pipelines and or canals? The public should be told so it understands how much water will be lost.

7) On page 3, the maintenance costs are not mentioned. What will the maintenance costs be?

8) On page 3, the impacts that the proposal will have on Big Thicket National Preserve, both direct and indirect, as well as cumulative are not discussed and must be to give the RHWPG and the public information about this significant environmental cost.

9) On page 3, the memorandum states, "Additionally, this cost includes no estimate for upgrades to existing conveyances required that would deliver Sabine or Neches River water from the Trinity and San Jacinto Rivers to customers". The full costs of the East Texas water transfer strategy have not been computed and should be so the RHWPG and the public can review and comment on these.

10) On page 4, Issues and Considerations, there is no discussion that Region I and Region H have made no decision with regard to the water that the East Texas water transfer strategy will use. Fish and wildlife impacts are also an issue that needs to be considered and evaluated and the costs provided to the RHWPG and the public for review and comment.

11) On page 6, the monthly inflow target percent compliance for maximum C, Minimum Qsal, and Minimum Q are low (29% to 66%) and not encouraging.

12) On page 6, the memorandum states, "Rectification of some segment of the river (West Fork of the San Jacinto River) may be required". The HSC is opposed to any rectification (channelization) of the West Fork, whether in SHNF or not, and the additional impacts that will occur due to this water transfer.

13) On page 6, the memorandum states, "Increased use of stored water from lake Livingston may result in periodic or prolonged low lake levels, which may adversely impact property values and recreational revenues in Walker, Trinity, San Jacinto and Polk Counties". The estimated costs of these impacts should be provided for RHWPG and public to review and comment.

Region H Water Management Strategy Analysis Technical Memorandum for Allens Creek Reservoir

1) On page 2, the memorandum states, "Delivery to downstream customers using the bed and banks of the Brazos River would require a subsequent permit". The environmental impacts of such a strategy should be clearly documented so that the RHWPG and public can review and comment.

The use of a bed and banks permit to convey Allens Creek Reservoir water downstream to a user would increase instream flows during low flow periods. The alternative to this is the construction of a pipeline from the reservoir to the end-user.

2) On page 2, Alligator Hole is mentioned as an important wetlands. What impact will the Allens Creek Dam project have on this wetlands? The RHWPG and the public needs this information so that they can review and comment.

On page 2, it states that the dam alignment was reconfigured to exclude Alligator Hole from the project area.

Region H Water Management Strategy Analysis Technical Memorandum for Municipal Water Conservation

1) The HSC supports municipal water conservation and maximum implementation of this water strategy.

Comment Noted

2) On page 6, Results, the HSC supports a stronger and more stringent water conservation program for WUGs with populations with less than 3,301 and between 3,300 and 10,001.

See previous response to comments received in a letter dated December 14, 2004.

The intent of the technical memorandum was not to limit recommended conservation strategies, such as water conservation pricing, for the region. The Region H Water Planning Group recommends that all of the BMPs included in the TWDB water conservation task force report be included as potentially feasible BMPs in this strategy. This recommendation is more clearly defined in the revised strategy.

Three different groups of municipal WUGs, based on size, were established for estimating potential water savings and costs for the region. Various levels of intensity for water conservation programs are anticipated depending on the size and related resources available for each WUG to implement a conservation program. It is expected that larger entities, with generally greater resources and larger demands, will have more resources and more incentive to develop more comprehensive conservation programs than will be available to smaller entities. The three groups of WUG sizes were established to address this assumption.

Thank you for your comments.

Sincerely,

Michael V. Reedy, P.E.
Project Director

Attachments: Sierra Club Letter Dated March 28, 2005

c: Brandt Mannchen
David Parkhill
Michael Reedy
Jason Nelson
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Region H Committee

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April 19, 2005

Mr. Jim Adams
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and

Mr. Andrew A. Sterbenz
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Dear Jim and Andrew,

Enclosed are the comments of the Houston Regional Group of the Sierra Club (Sierra Club) regarding the draft of Chapter 4 of the Region H Water Plan, Identification, Evaluation and Selection of Water Management Strategies Based on Needs; Chapter 7, Long-Term Protection of the State's Water Resources, Agricultural Resources and Natural Resources; and other documents that we received at the April 6, 2005 Region H Water Planning Group (RHWPG) meeting.

Comments on Chapter 4

1) **On page 4-1, 4.,** this document states "In addition to the above, this report contains a description of socioeconomic impacts of not meeting the identified needs." This document should also discuss the socioeconomic impacts of meeting the needs. This analysis should include how Quality of Life will be affected, for instance the impacts that the increased population and development growth will have on air quality, water quality, toxic chemical use and disposal, noise, wildlife habitat, ecosystem functioning, traffic, etc.

2) **On page 4-4, 4.2,** this documents states "Two additional strategies were considered, an interbasin transfer of existing supplies from east Texas (i.e., the Lower Neches Valley Authority and the Sabine River Authority)". The HSC is

opposed to the interbasin transfer of water from the Neches/Sabine Rivers. The environmental impacts due to the construction of the project and the cumulative environment impacts that will be caused by the increased population and development growth caused by the availability of too much water will cause too much damage to the human environment.

3) **On pages 4-4 and 4-5, 4.2.1,** the HSC does not support the Bedias Reservoir, Bedias Reservoir to Lake Conroe Transfer, Little River Reservoir, and the Sabine Basin to Region H Interbasin Transfer projects. The HSC is concerned about the impacts that the Bedias Reservoir and transfer projects will have on Sam Houston National Forest and West Fork of the San Jacinto River bottomland hardwood forested wetlands.

4) **On page 4-5, 4.2.1,** the document states "Assessment of each of the potential management strategies conducted as part of this study included an evaluation of cost, environmental impacts". The assessment of environmental impacts was not detailed and therefore did not fully reveal the full depth and extent of these impacts.

5) **On page 4-6, 4.2.2,** the phrase "Brazos G Water Planning Group" is used. Should not the phrase be "Region G Water Planning Group"?

6) **On page 4-7, 4.2.4,** the HSC disagrees that drought management should not be a water management strategy. We believe that implementing a drought management plan early during periods of infrequent rainfall will help conserve water and protect the public. The HSC does not agree with the statement "Only the development of reliable supplies to meet projected growth will protect the region from the economic impacts of a prolonged drought." This is a recipe which will drag down opportunities to reduce environmental damage and pressure on our natural resources because population and development growth slowing or reduction will not occur.

7) **On page 4-8, 4.3,** the document states "Finally, the RHWPG assumed that every municipal WUG with a projected shortage would utilize conservation before seeking out or increasing a WWP contact." The real question is how much and how effective water conservation measures will be implemented.

8) **On page 4-10, 4.3.1,** the document states "Certain strategies (i.e., the inter-basin transfer of supply from east Texas and all of the potential reservoir sites) were rated negatively due to the significant habitat and flow impacts these projects entail." The HSC emphasizes that these projects would be unacceptably detrimental to the human environment.

9) **On page 4-13, 4.3.3, Table 4-5,** the HSC opposes the Bedias Reservoir and Transfer and the Little River Reservoir. We also do not agree with the designation of Alternative Water Management Strategies since alternatives are

used as a way to allow environmentally damaging projects, which along with the change in the amendment process that RHWP is supporting, can be implemented with little or no public notice and input.

10) **On page 4-14, 4.3.3,** the HSC opposes the Bedias Reservoir and Transfer into Lake Conroe.

11) **On page 4-14, 4.3.4,** the HSC opposes the mention of Future Water Management Strategies. It appears the reason that these water management strategies are mentioned (including East Texas water transfer, Bedias Reservoir, and Little River Reservoir) is to give them future credibility as reasonable water management strategies so that they can be implemented more easily. These strategies are not reasonable and will result in environmental damage that is too great.

12) **On page 4-18, 4.5,** the HSC is concerned that the freshwater inflow targets are too.

13) **On pages 4-18 and 4-19, 4.5.2 and 4.5.3,** too little assessment of sedimentation has been conducted. As urbanization increases erosion, sedimentation of watersheds will increase as will non-point source water pollution. The consultants do not state what level of sedimentation occurs for each lake; what sedimentation is projected in the future for each lake; what level of lake capacity has been reduced now; and what is projected to be the reduction in each lake's capacity by sediment in the future. Therefore the public does not have data to review and comment on in this document about existing and projected future erosion and sedimentation of each lake.

14) **On page 4-21, 4.5.4.3,** ecologically it is not clear what leach level of inflow that is proposed will do and what is the most productive inflow for Trinity Bay.

15) **On page 4-24, 4.5.5.2,** the HSC is concerned about the redirection in water inflow into Galveston Bay. Presently, most of the inflow goes into Trinity Bay. This proposal redirects most of the inflow into the San Jacinto River. Trinity Bay is an ecologically more healthy estuary and needs more inflow than the area where the San Jacinto River flows into Galveston Bay and the Houston Ship Channel.

16) **On page 4-27, 4.5.5.4,** the HSC is concerned that during drought periods when there is full use of authorized diversions of water that there will be very low freshwater inflows into Galveston Bay. This will cause extreme impacts on the Galveston Bay Estuary.

17) **On Tables 4A-3 and 4A-4,** the HSC opposes the Bedias and Little River Reservoirs, the Bedias transfer project, and the East Texas transfer project due

to the impacts on the human environment that these projects will have individually and cumulatively.

18) In the **Irrigation Conservation technical memorandum,** it is not clear how agricultural irrigation conservation will occur. The RHWPG needs to be more detailed how conservation will be implemented for agriculture.

19) In the **Little River Reservoir technical memorandum,** the HSC is opposed to this project.

20) In the **Region H Management Strategies-Imports,** the HSC is opposed to the Bedias Reservoir.

Comments on Chapter 7

1) **On pages 7-1, 7-2, and 7-6, 7.1.2, 7.1.4, and 7.1.2 (Parks and Public Lands),** the HSC is concerned about dewatering and ecological vegetation community impacts that will occur to the Trinity River National Wildlife Refuge. The HSC is also concerned about the impacts of reduced flows in the Trinity River and inflows in Trinity Bay that the Region H Water Plan (RHWP) recommends.

2) **On page 7-4, 7.1.6,** the HSC is concerned that "The increase in return flows from this source will mitigate, but not remedy, the reduction in base flows due to full use of water rights in the basin." This means in drought times that Galveston Bay will be given a low priority for fulfillment of its needs.

3) **On pages 7-5 and 7-6, 7.1.1,** the HSC is opposed to the Bedias and Little River Reservoir projects. Other impacts that will affect sensitive species include dewatering of bottomlands which allows upland and exotic species to grow in bottomland areas. The HSC is not aware of any research that documents that "peripheral wetlands should naturally migrate with the waters edge" when the RHWP is implemented.

4) **On page 7.7, 7.1.4,** the HSC is concerned that inflow amounts will be switched between the San Jacinto and Trinity Rivers. The HSC is opposed to the Bedias Reservoir and transfer projects.

5) **On page 7C-1,** the HSC opposes the East Texas interbasin transfer, Little River Reservoir, and Bedias Reservoir and transfer projects.

6) **On pages 2, 7-14, 23 and 24, 27-29, 32-34,** the HSC is opposed the Little River Reservoir, Bedias Reservoir and transfer, and East Texas interbasin transfer projects. The HSC is opposed to the San Jacinto River Authority/Lake Livingston Diversion project if it impacts Sam Houston National Forest.

7) **On pages 15-19,** the HSC is concerned about the destruction of Luces Bayou. There must be mitigation of at least 5 or 7:1 replacement acreage for the loss of bottomland hardwood forested wetlands. The floodplains of the San Jacinto River (West and East Forks) and Tarkingston Bayou should be protected as part of mitigation for Luce Bayou.

8) **On page 20, San Jacinto River Authority/City of Houston Contract,** the HSC is concerned about the increase in exotic/upland species entering dewatered bottomland hardwood forested wetlands as mentioned in this document, "Reductions in instream flows will likely cause alteration/loss of aquatic habitat and may impact aquatic organisms as well as riparian habitats."

9) **On page 23, San Jacinto River Authority/Lake Livingston Diversion,** the document states "Environmental concerns related to this project include construction within the upper West Fork San Jacinto River channel and rectification of some segment of the river will likely be required." The HSC is opposed to rectification of the West Fork of the San Jacinto River.

10) **On page 25, Trinity River Authority/City of Houston Contract Agreement,** the document states "Additional transfer of Trinity River water supplies into the San Jacinto River basin will decrease freshwater inflows into the Trinity Bay estuary and may negatively impact wetland, aquatic, and riparian habitats." This document should state on this page that the Trinity River National Wildlife Refuge may be dewatered by this water management strategy.

Comments on Consultants Report Legislative Recommendations April 6, 2005

1) **On page 9,** the HSC is opposed to RHWPG's support of reduced public participation and visibility of the water planning process. This will occur if the proposed legislation that the RHWPG backs is approved. This legislation limits the what the amendment process covers.

2) **On page 10,** regarding flood control, the best alternative is to buy out the 100 year floodplain and allow no further building in this flood-prone area.

Comments on Consultants Report Agenda April 6, 2005

1) **On page 10,** the HSC is opposed to the Bedias Reservoir and transfer project, the Little River Reservoir, and the transfer of water from East Texas.

2) **On pages 14-21,** the HSC urges the RHWPG to reconsider and approve the following stream segment portions that flow through Sam Houston National Forest as unique stream segments: Little Lake Creek, West Fork of the San Jacinto River, West Sandy Creek, Winters Bayou, Henry Lake Branch, East Sandy Creek, East Fork of the San Jacinto River, Boswell Creek, Briar Creek,

Caney Creek, and Harmon Creek. The HSC also supports the inclusion of Cedar Lake Creek, Lone Oak Bayou, and Whites Bayou as unique stream segments in the RHWP.

Comments on Public Review and Comment

1) The HSC supports holding three public hearings for the RHWP. These three public hearings should be held in Walker, Harris and Brazoria Counties. There should be two public hearings held on each day. One hearing will be held at 2 p.m. and one will be held at 7 p.m. In this manner people can attend during the day or during the evening. Therefore people who can attend during normal work hours can do so and those who cannot can do so during the evening.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, Texas 77096
713-664-5962

April 26, 2005

Mr. Brandt Mannchen
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Subject: Response to Comments on Draft Chapters 4 and 7 of the 2006 Region H Regional Water Plan and other documents received at the April 6, 2005 RHWPG Meeting.

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input to draft Chapters 4 of the Region H Water Plan - Identification, Evaluation and Selection of Water Management Strategies Based on Needs, Chapter 7 - Long-term Protection of the State's Water Resources, Agricultural Resources and Natural Resources, and other documents distributed at the April 6, 2005 Region H Water Planning Group (RHWPG) meeting. The following letter provides responses to the comments you provided in your letter dated April 19, 2005.

We would again like to make a distinction between the draft report chapters and the presentation materials addressed in your letter. While you are welcome to comment on both, please understand that some of the presentation materials were intended to guide the Planning Group discussion, and do not reflect the decisions made at the meeting. Additionally, the Consultant Team would like to point out that you only need to state your opposition to a given project (such as Bedias Reservoir) once in your letter.

Response to Comments on Chapter 4

1) Page 4-1, requesting an analysis of the socioeconomic impacts of meeting water needs.

The RHWPG is neither mandated nor funded to conduct the analysis you propose. Only the impacts of not meeting needs must be considered under the Regional Water Planning Guidelines.

2) Page 4-4, expressing Houston Sierra Club (HSC) opposition to interbasin transfers from the Neches and Sabine River Basins.

Comment Noted.

3) Page 4-5 and 4-5, expressing HSC opposition to the Bedias Reservoir, Bedias Transfer, Little River Reservoir and Sabine to Region H Transfer strategies.

Comment Noted.

4) Page 4-5, expressing HSC opinion that the evaluation of environmental impacts was not detailed.

The analysis of water management strategies prepared for the Regional Water Plan predominantly consistent of computer modeling (of flows) and the compilation of information from existing studies. The scope and budget allocated by the Texas Water Development Board to the RHWPG did not allow for

site-specific environmental studies at the level of detail you are suggesting. Please recognize that the regional water planning process does not grant implementation permits. Sponsors must still obtain all required water rights and environmental permits for the strategies recommended in the plan. The anticipated environmental studies for these strategies are noted in the technical memoranda. As these studies are completed, those results will be reviewed and will be reflected in later updates to the regional plan as appropriate. The regional water planning group may decide, for any reason, to replace or modify that strategy in the next update to the plan. For example, in the 2001 Region H Plan, Allens Creek Reservoir was recommended as a strategy. During the water rights permitting process, Alligator Hole was identified as a wetland area on the project site that required protection. Subsequently, the project configuration was adjusted by the project developers to protect the wetland, and the new configuration of the project is now reflected in the draft 2006 plan.

5) Page 4-6, asking if "Brazos G Water Planning Group" is the correct name.

Region G adopted the name "Brazos G Water Planning Group" during the initial round of regional water planning, and should be referred to that way. Similarly, Region I adopted the name "East Texas Water Planning Group".

6) Page 4-7, advocating drought management as a water management strategy.

As stated in your comment, drought management conserves water. Drought management plans typically force conservation over a limited period of time. However, the drought of record that this plan must address lasted approximately five years. To achieve a sustained reduction in demand, water conservation strategies must be implemented, so that water users do not perceive the required changes as being temporary. Some of these water conservation strategies (particularly for agriculture) require capital construction or physical modifications to water conveyance facilities, and cannot be implemented on short notice.

7) Page 4-8, asking about the size and effectiveness of municipal water conservation measures.

This management strategy has been tailored for small, medium and large water user groups (WUG), as discussed in the technical memorandum in Appendix 4B. While the projected demand reductions are based on a most-likely list of best management practices, the results will vary depending upon how each WUG implements their program.

8) Page 4-10, expressing that projects which impact wildlife habitat and instream flows are also detrimental to the human environment.

Comment Noted.

9) Page 4-13, expressing HSC opposition to the Bedias Reservoir, Bedias Transfer, and the Little River Reservoir.

Comment Noted.

10) Page 4-14, again expressing HSC opposition to the Bedias Reservoir and Bedias Transfer.

Comment Noted.

11) Page 4-14, the HSC "opposes the mention of Future Water Management Strategies."

The RHWPG appreciates your candor. Under the current planning rules, water management strategies considered during the planning process are ultimately recommended or not recommended as part of the regional water plan. The discussion of Alternative and Future Strategies in the text identifies those strategies that were not recommended, but may merit reconsideration in future planning cycles where even greater water demands must be addressed.

12) Page 4-18, "the HSC is concerned that the freshwater inflow targets (for Galveston Bay) are too."

This comment is incomplete.

13) Page 4-18, requesting a better explanation of reservoir sedimentation.

A table will be added in Chapter 3.3, surface water sources, showing the original, year 2000 and projected year 2060 storage volumes for the reservoirs serving Region H. Chapter 4 will not be changed.

14) Page 4-21, stating it is not clear in the report what is the most productive inflow for Trinity Bay.

There is no single freshwater inflow amount identified as ideal for Trinity Bay by the resource agencies. The amount of inflow, the seasonal distribution of that inflow, and the frequency of flood and drought cycles are all identified as affecting productivity of the estuary system. The resource agencies identified various target inflows and seasonal distributions for various goals. The Galveston Bay Freshwater Inflows Group ultimately selected one set of inflow targets and recommended frequencies as a general goal for the regional planning process. These selected inflow targets and frequencies were used as the basis of comparison for the modeling scenarios in this plan.

15) Page 4-24, expressing concern about the redirection of inflows from Trinity Bay into the San Jacinto River Basin.

Comment Noted.

16) Page 4-27, expressing concern about the full use of water rights and reduced inflows to Galveston Bay.

Your comment is noted. Please understand that the lowest line on the graphs in that section represents no wastewater return flows entering the San Jacinto and Trinity basins, to include return flows from the upper Trinity Basin. This scenario requires a significantly greater amount of wastewater reuse than is recommended in the Region C and H plans.

17) Tables 4A-3 and 4A-4, expressing HSC opposition to the Bedias Reservoir, Bedias Transfer, and the Little River Reservoir.

Comment Noted.

18) In the Irrigation Conservation Technical Memorandum, it is not clear how this conservation will be implemented.

This conservation must be undertaken by the individual landowners. The RHWPG has recommended that state programs be increased to provide financial assistance for irrigation conservation.

19) The HSC is opposed to the Little River Reservoir (mentioned in the Technical Memorandum).

Comment Noted.

20) The HSC is opposed to Bedias Reservoir (mentioned in the Technical Memorandum).

Comment Noted.

Response to Comments on Chapter 7

1) Page 7-1 to 7-6, the HSC is concerned about reduced instream flows impacting the Trinity River National Wildlife Refuge.

The Trinity River National Wildlife Refuge is located on the Trinity River below the City of Liberty. The Wallisville Saltwater Barrier maintains water level on that portion of the river, to allow navigation to the Port of Dayton and protect certain diversion points from saltwater influence. The national wildlife refuge is therefore protected, albeit indirectly.

2) Page 7-4, the HSC is concerned that the reduced return flows discussed in section 7.1.6 means that Galveston Bay will be given a low priority for fulfillment of its needs.

Section 7.1.6 discusses the Brazos River Basin, which does not flow into Galveston Bay. The specific sentence cited in your comment discusses the Freeport Desalination Strategy, which adds new water to the basin.

3) The HSC is opposed to Bedias and Little River Reservoirs. It is concerned about the dewatering of bottomlands and is concerned about the discussion of peripheral wetlands in the report.

Your concern about dewatering bottomlands in noted. The sentence you cite about peripheral wetlands refers to the Luce Bayou transfer strategy, which will increase flow in that stream. This will increase the portion of the bank area that is seasonally inundated and suitable for wetlands species. Over time, wetlands species should supplant the upland species in these fringe areas.

4) Page 7-7, The HSC is concerned about the transfer of inflows from the Trinity to the San Jacinto basin, and is opposed to Bedias Reservoir.

Comment Noted.

5) Page 7C-1, The HSC is opposed to Bedias Reservoir, Little River Reservoir, and the East Texas interbasin transfer.

Comment Noted.

6) Appendix 7C, The HSC is opposed to Bedias Reservoir, Little River Reservoir, the East Texas interbasin transfer, and the Lake Livingston to SJRA transfer.

Comment Noted.

7) Appendix 7C, The HSC advocates mitigation of 5:1 up to 7:1 for any bottomland hardwood forests impacted by the Luce Bayou transfer.

Comment Noted.

8) Appendix 7C, The HSC is concerned about the potential increase in upland species in bottomland hardwood areas (caused by allocating Lake Conroe supplies to Montgomery County vice Harris County).

Comment Noted.

9) Appendix 7C, The HSC is opposed to rectification of the West Fork of the San Jacinto River (as part of a Lake Livingston to SJRA transfer).

Comment noted. This strategy was not recommended in the 2001 plan, nor was it reconsidered in the 2006 plan.

10) Appendix 7C, page 25, this document should state that the Trinity River National Wildlife Refuge may be dewatered by the transfer of supply to the San Jacinto River Basin.

As discussed earlier, the Trinity River NWR is on a reach that is protected by the Wallisville Saltwater Barrier. Therefore, a minimum water level will be maintained.

Response to Comments on Consultants Report on Legislative Recommendations

1) Page 9, the HSC is opposed to the RHWPG's support of reduced public participation and visibility of the water planning process.

The presentation slide cited and the related discussion during the meeting did not advocate reducing public participation and visibility. It addressed the water rights permitting process and the way to address new permit applications within the regional plans. The RHWPG questions the need to amend regional water plans to include new water rights applications as strategies, because the TCEQ permitting process already includes public notice, review and comment steps. The final recommendation from the group to the legislature on this topic is still being formed.

2) Page 10, the HSC advocates buying out the 100-year floodplain and not allowing development in flood-prone areas.

Comment noted.

Response to Comments on Consultants Report, April 6, 2005 Agenda

1) Page 10. The HSC is opposed to Bedias Reservoir, Little River Reservoir, and the East Texas interbasin transfer.

Comment noted.

2) Pages 14-21. The HSC urges the RHWPG to reconsider and approve the streams nominated as Unique by the HSC.

Comment noted.

Response to Comments on Public Review

1) The HSC recommends the RHWPG conduct Public Hearings on the initially prepared plan at three locations: Walker, Harris and Brazoria Counties. They recommend holding two sessions per location, at 2 p.m. and 7 p.m.

Your recommendation will be considered by the RHWPG.

Thank you for your comments.

Sincerely,

Andrew A. Sterbenz, P.E.
Project Manager

Attachments: Sierra Club Letter Dated April 19, 2005

c: Region H Water Planning Group
David Parkhill
Michael Reedy
Glenda Callaway

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May 8, 2005

Mr. Jim Adams
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and

Mr. Andrew A. Sterbenz
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Dear Jim and Andrew,

Enclosed are the comments of the Houston Regional Group of the Sierra Club (HSC) regarding the Region H Water Planning Group's (RHWPG) draft Chapter 8, Ecologically Unique Stream Segments, Unique Reservoir Sites and Legislative Recommendations; Chapter 9, Water Infrastructure Financing Recommendations; Region H Water Plan (RHWP) Executive Summary; and associated documents of the RHWP.

Chapter 8, Ecologically Unique Stream Segments, Unique Reservoir Sites and Legislative Recommendations

1) **On page 8-4, Table 8-1, Streams Considered for Recommendation as Unique,** the HSC appreciates the consultant's work in reviewing stream recommendations. However, we believe the consultant incorrectly screened and analyzed some of the candidates that the HSC submitted.

For example, Caney Creek (Walker/Harris Counties), East Sandy Creek, Briar Creek, Henry Lake Branch, West Sandy Creek, Little Lake Creek, and the West Fork of the San Jacinto River should have been assessed as having met the high water quality/aesthetic value criterion. Several of these streams are spring-fed

and or the water quality appears to be at least as good as other streams that were assessed as having high water quality/aesthetic value.

The same can be said for biological function criterion for West Sandy Creek, the West Fork of the San Jacinto River, Little Lake Creek, Henry Lake Branch, and Briar Creek since all of these streams have important biological assemblages of organisms and important wetland, aquatic, and terrestrial habitats that exist in beside, or adjacent to them.

Therefore we believe the analysis conducted was deficient and does not reflect the importance of these streams. The analysis inadvertently makes these streams appear to the public and decision-makers as less biologically and ecologically important than they actually are.

2) **On page 8-7, 8.2.5 Big Creek (San Jacinto),** the portion of the Lone Star Hiking Trail that runs through Big Creek Scenic Area is designated as a National Recreation Trail.

3) **On pages 8-11 and 8-12, 8.3 Unique Reservoir Sites,** the HSC is opposed to designating Bedias Reservoir as a unique reservoir site since its construction and transfer of water to Lake Conroe will negatively impact Sam Houston National Forest, bottomland hardwood forested wetlands, and recreational areas. Bedias Reservoir is not needed for water use for at least the next 50 years and local sponsors are not able or are unwilling to fulfill their fiscal obligations. The HSC believes that construction of this reservoir will cost much more than the $142,700,000 that is quoted.

4) **On page 8-16, 8.4.3, Consistency with the Regional Water Plans,** the HSC is concerned that this recommendation will result in a reduction of public participation notification. By the time Texas Commission on Environmental Quality (TCEQ) approves a water rights permit the momentum to designate the permit as consistent with the RHWP will be overwhelming politically and the public will be hard pressed to prevent such a proposal.

5) **On page 8-17, 8.4.3, Notification Procedures for Regional Plan Amendments,** the HSC opposes the reduction of public notification and participation opportunities for significant amendments to the RHWP. This recommendation does not define what "limited portion of the region" means and does not differentiate between what are significant and non-significant amendments. The HSC cannot support this recommendation as a blanket statement because of this failure to differentiate between significant and non-significant.

6) **On page 8-17, 8.4.4, Interbasin Transfers,** the HSC opposes changing junior water rights requirements. It is only fair that water rights holders take their turn and not attempt to reprioritize other water rights holders. By eliminating junior

water rights requirements the State of Texas supports and encourages living beyond our water means. This action would continue the support of the wrong-headed policy of exceeding carrying capacity for a watershed. This policy takes opportunities for Quality of Life and growth from one watershed and gives them to another watershed.

This proposal ensures that environmental protection will take a backset to additional development and growth. Quality of Life will suffer and people will have a less peaceful life than they would if they lived within their means.

7) **On pages 8-17 and 8-18, 8.44, Instream Flows and Bay and Estuary Inflows,** the updating of environmental flow set-asides (every 10 years) should be synchronized with the update of the RHWP (every 5 years). This ensures that environmental flow set-sides are not forgotten and get the benefit of the most recent scientific research in the RHWP before irretrievable political and financial commitments are made.

8) **On page 8-19, 8.44, Water Supply Project Financing Mechanism,** the HSC is opposed to this recommendation since it will encourage unneeded and environmentally damaging water projects.

9) **On page 8-20, 8.44, Agricultural and Irrigation Conservation Funding,** the HSC supports implementation of agricultural water conservation and methods to accomplish this.

Chapter 9, Water Infrastructure Financing Recommendations

The HSC understands that Chapter 9 will be incorporated into Chapter 8 at the request of the Texas Water Development Board (TWDB).

1) The information for water infrastructure financing is not complete so the HSC will not be able to provide complete comments on this part of the Region H Water Plan (RHWP).

2) **On page 9-2, 9.3.1 Summary and pages 9-3 and 9-4,** the HSC is concerned that the State Participation Program will lead to the construction of water projects that are not needed or whose need will not be required for decades. This appears to be a backdoor way to subsidize water projects that otherwise could not be justified on their own merit and which local interests are either incapable or do not want to pay their fair share of project costs.

At the Region H Water Planning Group meeting on May 4, 2005 some members stated that subsidies for desalination projects were not appropriate and that the free market should decide who and how water is provided. Apparently this concern about subsidies disappears when talking about water reservoirs and

conveyance projects where local interests cannot or do not want to shoulder their own fiscal responsibilities.

The HSC is concerned that speculative water projects will be funded and developed through this program that artificially induce growth in human population and development which will further strain the State of Texas' ability to supply needs to citizens and will further exceed the carrying capacity of watersheds and their ability to service existing populations.

In particular the HSC opposes using this fund to pay for the Bedias Reservoir and its transfer facilities. These projects will negatively impact Sam Houston National Forest, bottomland hardwood forested wetlands, and recreational areas. Sam Houston National Forest has lost several thousand acres, that never were mitigated, due to the construction and operation of Lake Conroe.

3) **On page 9-2, 9.3.1 Summary,** the HSC supports ways to encourage irrigation conservation for agriculture and other high water users

4) **On page 9-3, 9.3.1 Summary and pages 9-5 and 9-6,** the HSC is concerned about the comment made at the May 4, 2005 RHWPG meeting that some communities, like Tamina, near The Woodlands, have water supply problems but do not qualify for any existing programs to assist them with their needs. The HSC urges the RHWPG to recommend to the TWDB and the Texas Legislature that a new program be created and fully funded to meet the needs of these unqualified and overlooked communities.

5) **On page 9-3, 9.3.1 Summary and pages 9-8 and 9-9,** the HSC does not support further involvement by the U.S. Corps of Engineers in water projects in the Region H area. The Corps has a poor track record of protecting the environment and financially not been honest with the U.S. Congress and the American Public about financial costs of all of its water projects.

The HSC opposes the Bedias Reservoir and its transfer facilities and their designation as Corps projects because these projects will negatively impact Sam Houston National Forest, bottomland hardwood forested wetlands, and recreational areas. Sam Houston National Forest has lost several thousand acres, that never were mitigated, due to the construction and operation of Lake Conroe.

6) **On page 9-4, State Revolving Fund Programs,** these programs should also allow the acquisition of recharge areas. This will ensure that recharge areas are protected from activities that will negatively affect their water quality and quantity capability and carrying capacity over time.

Region H Water Plan Executive Summary

The HSC is not going to address this particular section of the RHWP comprehensively because it would dovetail with all the other comments we have submitted over that past 10 months. However, we have several comments that we want to make about this section.

1) **On pages E-3, Population Projections,** the HSC is extremely concerned that the RHWPG, TWDB, and the Texas Legislature are not asking Texans what kind of future they want for themselves, their children, their grandchildren, and all future generations. We are taking opportunities away from ourselves, children, grandchildren, and all future generations as we project population growth and development and then try to attain these projections by building to match them. We are caught in a spiral that will ever tighten on us as our resource use continues to expand and then our resources run low.

It is far better to plan for a population level and Quality of Life that Texans want versus accepting population projections that are deemed actualities instead of guesses.

2) **On page E-5, Water Demand Projections,** the HSC is concerned about a level of freshwater inflow in streams that flow into bays and estuaries that provides maximum productivity in only 50% of future years. This means at least 50% of the time Galveston Bay will not be functioning at its best and that during times of extreme drought the problem will be exacerbated even more. We do not want to sacrifice Galveston Bay, and all that it has to offer the community of life (both human and non-human), for additional population growth and development.

3) **On page E-9, E.5.3 Socioeconomic Impact of Not Addressing Shortages,** the RHWPG and TWDB make and or accept unrealistic assumptions that overestimate impacts if water is not provided at the levels projected for population estimates for 50 years in the future.

This is a scare scenario to get the public to accept what is proposed. This is not a fair or balanced calculation because the negative environmental impacts, a description of what this will mean for people's Quality of Life, and a visual narrative of what this will mean typically for people on a day-today basis are not given. The costs of meeting the population and development growth projections must be given which include much more than the $7.3 billion in recommended water management strategies (for example additional roads, congestion, air pollution, noise, light pollution, etc.).

4) **On page E-10, E.8 Protection of Water Resources and Natural Resources,** this draft RHWP is deficient because it does not estimate and describe what the impacts will be of switching most water flow entering Galveston Bay from the Trinity River to the San Jacinto River.

Written Comments Received from the Texas Water Development Board

1) The HSC is extremely concerned that the RHWPG has not fully complied with the requirements of state law and regulations regarding the environmental analysis required for the 2001 and 2006 RHWPs. In particular, the quantitative reporting of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico as required by 31 TAC 357.7(a)(8)(A)(ii), and stated in the March 14, 2005 TWDB letter, still has not been fulfilled for Amendment 1 for the 2001 RHWP and for the 2006 RHWP.

Tables 5A-1 and 5A-2 do not quantify all the environmental factors enumerated above. In The Random House Dictionary of the English Language, College Edition, 1968, quantitative is defined as, "that is or may be estimated by quantity or of or pertaining to the describing or measuring of quantity". Quantify is defined as, "to determine, indicate, or express the quantity of or to make explicit the quantity of".

To give one example in Table 5A-2, the RHWPG does not quantify what the return flows will be for Galveston Bay for each water management strategy, does not quantify how many (acres) and what kind of habitat may be impacted, and does not state which water entry point these return flows will enter Galveston Bay (Trinity River or San Jacinto River).

There is little quantitative data in Tables 5A-1 and 5A-2 which spells out the effects on environmental water needs, wildlife habitat, cultural resources, and effects of upstream development on bays, estuaries, and arms of the Gulf of Mexico.

For example, in the 2001 and 2006 RHWPs the following questions should be quantitatively answered:

How much development and what kind will occur and what impact will this have on flows into Galveston Bay?

What are the (quantitative) "minimal impacts on wetlands adjacent to streams" or "limited impacts" to wetlands?

What are the (quantitative) impacts for "limited impacts" to wildlife habitat?

How much (quantitative) does the SJRA Indirect Reuse reduce peak flows and impact low flows?

What impacts (quantitative) will new pump stations have in the COH Indirect Reuse, NHCRWA Interruptible Reuse, and BRA System Operations strategies?

How much (quantitative) will changes in diversion and return flow patterns occur and where?

How much (quantitative) will flows below Lake Houston (tidal portion) and Upper Galveston Bay be reduced?

How much (quantitative) will diversion be reduced from the Trinity Basin?

How much (quantitative) will peak flows be harvested and how much (quantitative) will the positive affect be on below median flows?

How much (quantitative) will the change in diversion and return flow patterns be, positive or negative?

How much (quantitative) will inflow be reduced to the Sabine estuary?

How many (quantitative) noxious species may be introduced and how much (quantitative) habitat may be invaded by them?

How much (quantitative) will brine outfall affect water quality?

How much (quantitative) will inflow to Trinity Bay be reduced?

How much (quantitative) will levels be reduced in Lakes Livingston and Toledo Bend?

Both the 2001 and 2006 RHWPs are deficient in quantifying and describing the environmental impacts of the proposed water management, alternative, and future strategies. Both plans do not meet minimum TWDB requirements.

The Sierra Club appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew
Houston, Texas 77096
713-664-5962

May 20, 2005

Mr. Brandt Mannchen
Chair, Forestry Subcommittee
Houston Sierra Club
5431 Carew St.
Houston, TX 77096

Subject: Response to Comments on Draft Chapters 8, 9 and the Executive Summary of the 2006 Region H Regional Water Plan and other documents received at the May 4, 2005 RHWPG Meeting.

Dear Mr. Mannchen:

The Region H Regional Water Planning Group Consultant Team appreciates your comments and input to draft Chapters 8 – Ecologically Unique Stream Segments, Unique reservoir Sites and Legislative Recommendations, Chapter 9 – Water Infrastructure Financing, the Executive Summary and other documents distributed at the May 4, 2005 Region H Water Planning Group (RHWPG) meeting. The following letter provides responses to the comments you provided in your letter dated May 8, 2005.

Response to Comments on Chapter 8

1) Page 8-4, requesting that data about certain streams be added to Table 8-1, and the recommendation of streams of unique ecological value be reconsidered.

The RHWPG appreciates your continued advocacy of streams within the Region, and encourages you, in the future, to submit appropriate supporting information with your initial recommendations. The data included in Table 8-1 and used for consideration by the RHWPG, was compiled by the Region H consultant team and the Texas Parks and Wildlife Department, and was adequate to address the questions of the RHWPG. The subsequent recommendations by the RHWPG were consistent with the group's previous selections for the earlier list of streams. No further consideration is believed to be appropriate.

2) Page 8-7, noting that the Lone Star Hiking Trail is designated as a National Recreation Trail.

The report will be updated to reflect this information.

3) Page 8-11, stating that the Houston Sierra Club (HSC) does not support the designation of the Bedias Reservoir site as unique for several reasons, including the fact that the plan does not require the addition of this reservoir during the 50-year planning period.

Your opposition to this project is noted. The Regional Water Planning rules allow for the recommendation of unique reservoir sites that may be needed beyond the 50-year planning horizon. The fact that it is not a recommended management strategy in the 2006 Regional Water Plan does not diminish the site's suitability or uniqueness.

4) Page 8-16, expressing concern that the recommendation on determining water rights consistency with the regional plans may reduce public participation.

The recommendation in the report asks the State Agencies to clarify the consistency requirement, so that duplicate efforts may be reduced. The TCEQ Water Rights permitting process requires public notice and comment periods, so the public is still allowed to participate in the process. Because the permitting process can take several years to complete, the application could be considered for the next update to the regional plan in parallel with the permit review process, and not require a separate plan amendment.

5) Page 8-17, stating that the HSC opposes any change to the amendment process that reduces the public notification requirements.

Your opposition to this recommendation is noted.

6) Page 8-17, stating that the HSC opposes any change to the junior water rights provision.

Your opposition to this recommendation is noted. In your comment, you state "It is only fair that water rights holders take their turn and not attempt to reprioritize other water rights holders." Water rights are prioritized by their date of issue (their seniority). The junior water rights provision in the Water Code was added fairly recently (in 1997). It makes a water right junior to the other rights in the basin if it is amended to permit an interbasin transfer, effectively making the senior water right holder give up his turn in the priority ranking. To be consistent with the position quoted above, the HSC should support the recommendation.

7) Page 8-17, the HSC recommends synchronizing the ten-year environmental flows review cycle with the five-year regional water planning cycle so that the most current data is used for each plan update.

The RHWPG appreciates this suggestion.

8) Page 8-19, stating that the HSC opposes the establishment of new water supply project financing mechanisms.

Your opposition to this recommendation is noted.

9) Page 8-20, stating that the HSC supports implementation of agricultural water conservation.

Your support of this recommendation is noted.

Response to Comments on Chapter 9

1) Stating that the HSC cannot provide full comments because the draft chapter was not complete.

This is understood. Please note that the recommendations section of this report is being moved into Chapter 8 per the guidance received from the TWDB.

2) Page 9-2, stating that the HSC is concerned that the State Participation Program will lead to the construction of water projects that are not needed. Projects will be funded and developed through this program may artificially induce growth in human population and development.

The State Participation Program is designed to assist project sponsors to meet current and projected future water demands. For some projects (such as reservoirs or regional water treatment facilities), the most cost effective project size may exceed the current demand for the project. In those instances, the State Participation Program allows the State to finance and own the excess capacity, and sell it back to the local

sponsor as demands for the supply increase. The TWDB cannot fund a project that is purely speculative in nature. The HSC disagreement with the demand projections in the Regional Plan has been noted on numerous earlier occasions, and will not be further addressed here.

3) Page 9-2, stating that the HSC supports ways to encourage irrigation conservation.

Your support of this recommendation is noted.

4) Page 9-3, urging the RHWPG to recommend to the TWDB and the Texas Legislature that a new program be created and fully funded to meet the needs of the unqualified and overlooked communities such as Tamina and those discussed in during the May 4 RHWPG meeting.

The Texas Community Development Program already exists to address the water infrastructure needs of these communities. A new recommendation in support of this program has been drafted for RHWPG consideration.

5) Page 9-3, stating that the HSC opposes further involvement by the U.S. Army Corps of Engineers in water projects within the region.

Your opposition to this recommendation is noted.

6) Page 9-4, stating that the State Revolving Fund programs should allow the acquisition of recharge areas.

The Drinking Water State Revolving Fund program includes source water protection as a permitted fund use.

Response to Comments on the Executive Summary

1) Page E-3, stating that the HSC does not agree with the population projections used in the plan.

Your opposition is noted.

2) Page E-9, stating that the HSC is concerned about bay and estuary inflows that meet the maximum productivity targets for Galveston Bay only 50% of the time.

Your concern is understandable. Please note that the 50% frequency cited on that page is the recommended target frequency adopted by the Galveston Bay Freshwater Inflows Group. The historic frequency of meeting the maximum harvest inflows is 66% of the time, and the projected frequency of meeting them under the 2002 State Water Plan is 71% of the time. The inflow frequencies under the 2006 Regional Water Plan scenario could not be calculated, because at the time of this report the upper basin (Region C) management strategies were not available, but they are expected to be close to the historic frequency.

3) Page E-9, stating that the HSC disagrees with the socioeconomic impact analysis summarized in section E.5.3.

This section has been rewritten to reflect the 2005 socioeconomic analysis performed by the TWDB, which was received on May 5, 2005. The impacts under this model are smaller than in the 2001 analysis, which was quoted in the draft Executive Summary. Also, the total capital cost of the strategies

recommended in the 2006 Regional Water Plan was moved to an earlier section, so the reader would not be tempted to directly compare the capital costs with the estimated impacts.

4) Page E-10, stating that the HSC considers the impacts analysis within the draft plan deficient because it does not address the impacts of moving most of the Galveston Bay inflows from the Trinity River to the San Jacinto River.

The draft plan does not move most of the Galveston Bay inflows from the Trinity Basin to the San Jacinto Basin, but it does change the ratio of inflows into the bay. Under current conditions, 58% of the Bay inflows come from the Trinity River, and 34% come from the San Jacinto River (the rest comes from the coastal basins). Under the 2002 State Water Plan, 51% of Bay inflows will come from the Trinity River, and 40% will come from the San Jacinto. The overall inflow volume to the bay is estimated to be about the same with the recommended strategies as it is under current conditions (about 9.6 million acre-feet per year), with the range of flows remaining within the historic minimum and maximum limits.

Response to Other Comments

The HSC provided comments on the Region H response to comments received from the TWDB on Amendment 1 to the 2001 Region H Water Plan.

These comments are noted without response.

Thank you for your comments.

Sincerely,

Andrew A. Sterbenz, P.E.
Project Manager

Attachments: Sierra Club Letter Dated May 8, 2005

c: Region H Water Planning Group
David Parkhill
Michael Reedy
Glenda Callaway

May 13, 2005

Mr. Jim Adams, P.E.
Chairman
Region H Water Planning Group
c/o San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305

Subject: **West Harris County Regional Water Authority**
Region H Planning Group – 2006 Plan

Dear Mr. Adams:

This letter is to request that the Region H 2006 Plan include wording that the Brazos River Authority (BRA) and Brazos River are a potential alternate source of water for the West Harris County Regional Water Authority (WHCRWA). The BRA is a potential alternate source of water for the WHCRWA and WHCRWA feels it is important that the Region H Plan at least acknowledge this potential.

The WHCRWA long range plan currently is still for the City of Houston to be the supplier of water but there are preliminary discussions with the BRA as to the possibility of the BRA being an additional source of water in the future as the demand for the WHCRWA increases. The WHCRWA feels it is important that alternate sources be considered in order to provide the best, most cost effective system to the constituents of the WHCRWA.

The addition of the requested wording has been discussed with the City of Houston and they have indicated no objection to the additional wording and understand the WHCRWA needs to evaluate alternative water sources.

If you have any questions or would like to discuss this issue, please contact me at 713-527-6378.

Sincerely yours,

Wayne G. Ahrens, P.E.
Project Director

XC: Mr. David Parkhill
Mr. Dan Sallee
Mr. Alex Garcia