4C.9 LCRA-SAWS Water Project (LSWP)

4C.9.1 Description of Water Management Strategy

The Lower Colorado River Authority – San Antonio Water System (LCRA-SAWS) Water Project (LSWP) involves the conservation and development of approximately 330,000 acft/yr in the Lower Colorado River Basin Counties of Matagorda, Wharton, and Colorado. Of that 330,000 acft/yr, LCRA has made up to 150,000 acft/yr available to the San Antonio Water System (SAWS), for an 80-year period. In 2002, SAWS signed a Definitive Agreement with LCRA for the purchase and use of this water. The LSWP involves the potential future diversion of water from the Colorado River, development of off-channel storage, and conveyance through a transmission pipeline to the Twin Oaks Water Treatment Plant (WTP) site in south Bexar County. Water would then be treated and integrated into municipal supply systems in and around the City of San Antonio.

The configuration of the LSWP water management strategy is still being studied. Diversion points along the Colorado River from Colorado County to Bay City in Matagorda County are under consideration at this time. In addition, a diversion point near Bastrop could be used to deliver a portion of the 150,000 acft/yr to entities with needs in Caldwell and Hays Counties as recommended in the 2001 South Central Texas Regional Water Plan. The delivery point of the LSWP water is most likely the Twin Oaks WTP site in south Bexar County, however, a secondary delivery point in northeast Bexar County is also under consideration. As LCRA requested that the point of diversion for this water management strategy be Bay City for the 2001 South Central Texas Regional Water Plan, this point of diversion has been retained for cost estimation purposes in the 2006 Regional Water Plan. The Colorado River diversion locations and conceptual pipeline routes for the Bay City and Bastrop diversion locations are shown in Figures 4C.9-1 and 4C.9-2, respectively. Facility locations for the LSWP are approximate and will be determined upon further study by LCRA, SAWS, and their consultants (including CH2MHill[1]).

[1] CH2MHill, "Project Viability Assessment," Lower Colorado River Authority, November 2004

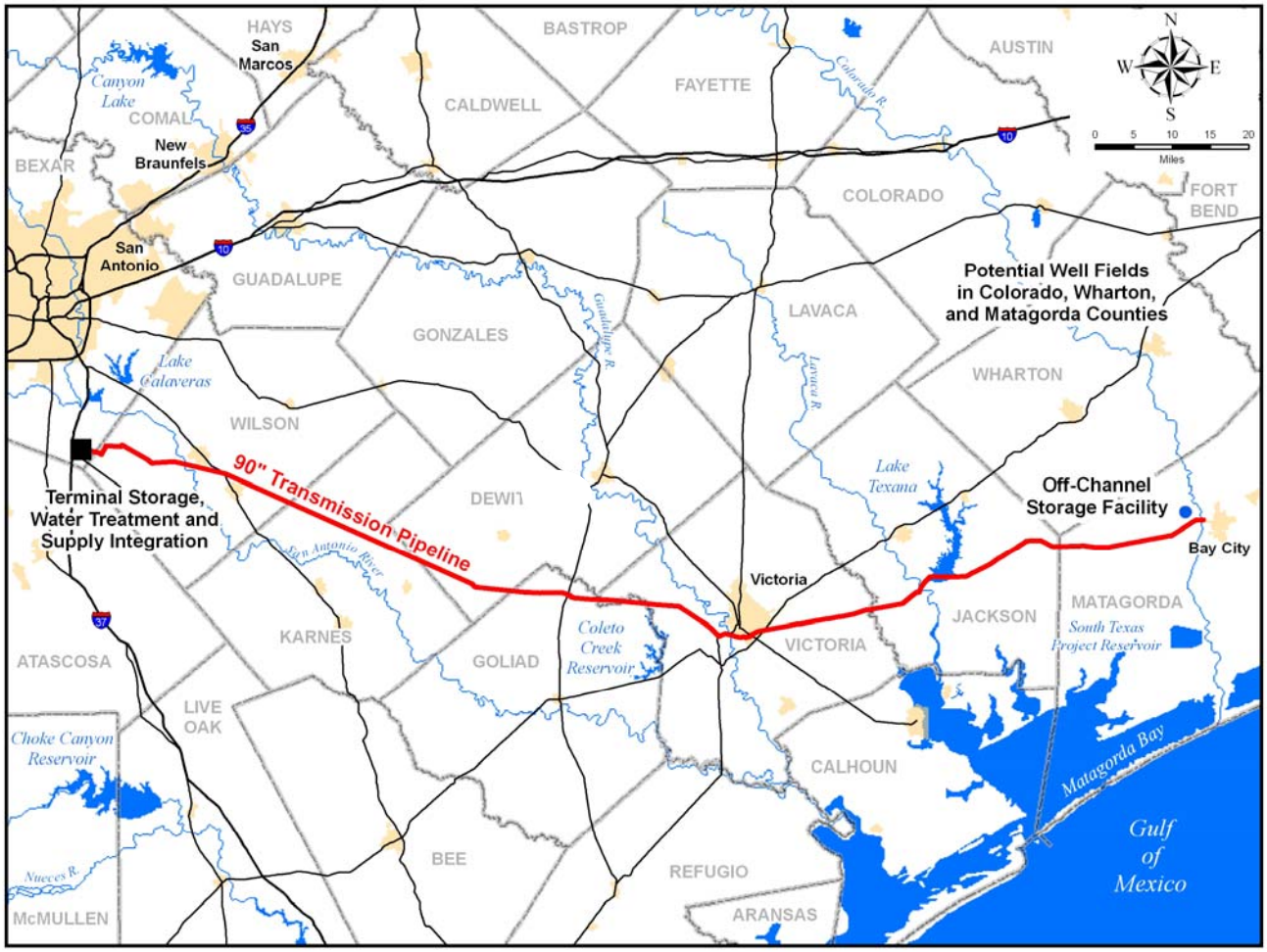

Figure 4C.9-1. LCRA-SAWS Water Project – Bay City to Bexar County (Facility Locations Subject to Change)

4C.9.2 Available Yield

Sources of water for the LSWP include presently under-utilized surface water rights, stored water from the Highland Lakes System, and new surface water appropriations. In order to meet local irrigation needs, various water conservation measures and periodic utilization of groundwater from the Gulf Coast Aquifer will be necessary. The Gulf Coast Aquifer groundwater will be used conjunctively with LCRA surface water rights to meet the needs of in-district farmers and will not be exported as part of the LSWP. LCRA has explored several combinations of these water supplies that could be used to ensure the availability of a dependable

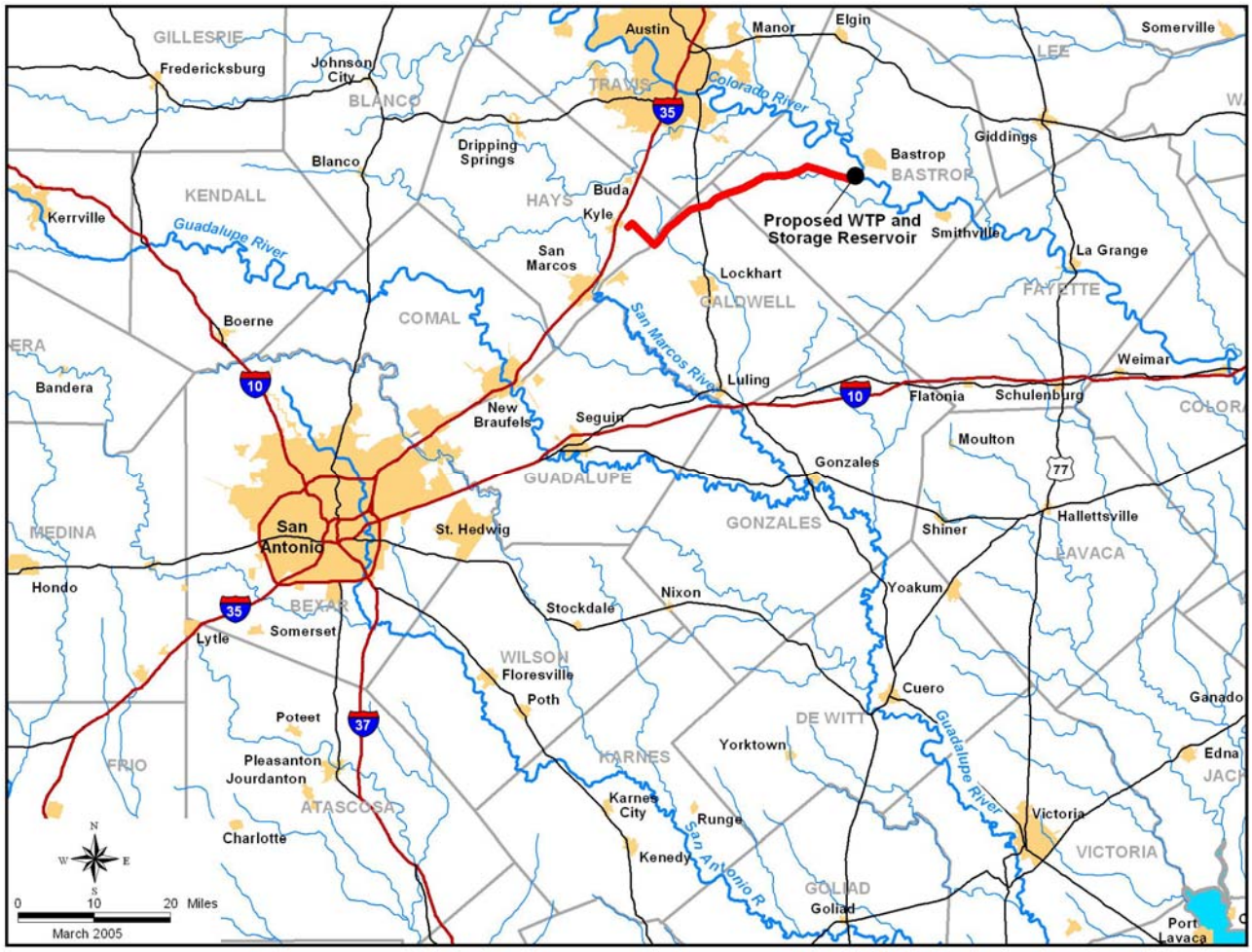

Figure 4C.9-2. LCRA-SAWS Water Project – Bastrop to Hays County

supply of 150,000 acft/yr to SAWS. While no final determination has been made to-date, one potential scenario for utilization of potential sources (provided by R.J. Brandes Company on behalf of LCRA and SAWS) is shown in Figure 4C.9-3 which summarizes simulated diversions from the Colorado River (in Colorado County) into off-channel storage. Figure 4C.9-4 illustrates the total storage in Lakes Travis and Buchanan of the LCRA Highland Lakes System with and without the project. With the LSWP, the minimum storage in the system increases from about 9,000 acft to about 211,000 acft and system storage is greater in approximately 72% of the months. Monthly long-term and drought average freshwater inflows for Matagorda Bay with and without implementation of the LSWP are illustrated in Figures 4C.9-5 and 4C.9-6,

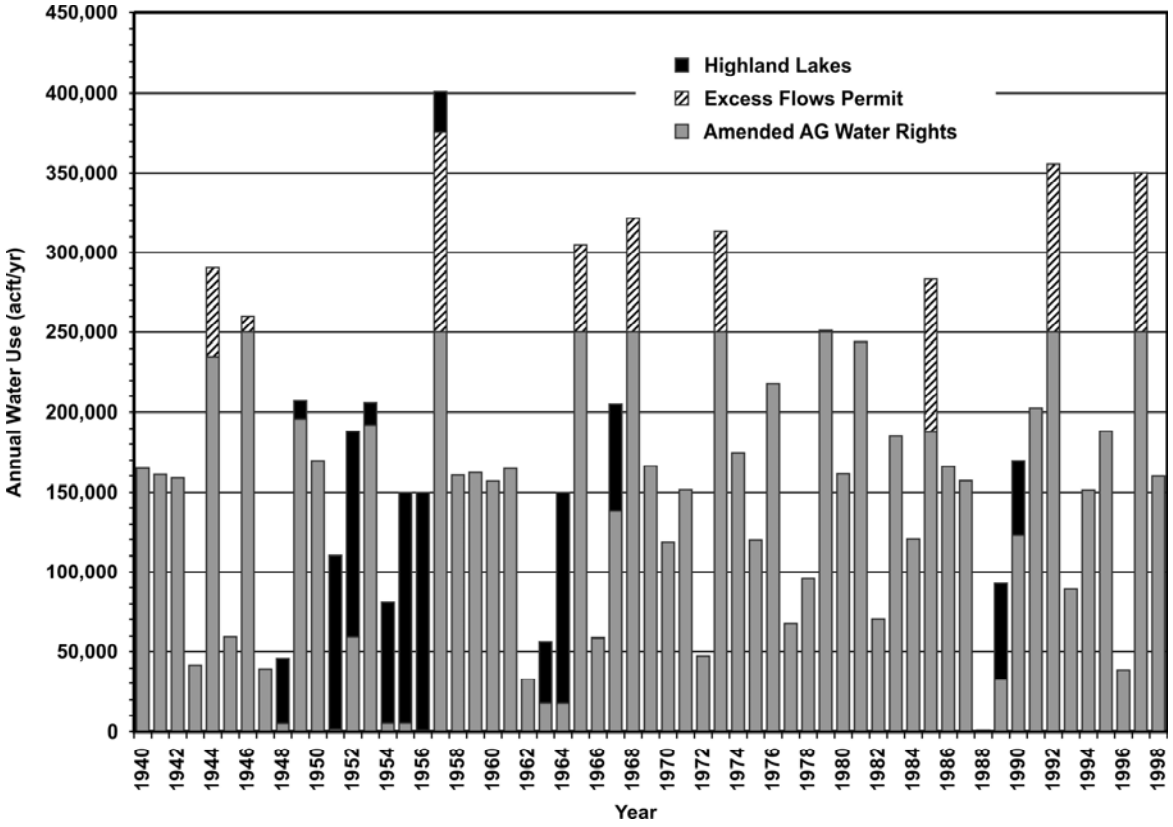

Figure 4C.9-3. LCRA-SAWS Water Project – Potential Water Supply Sources

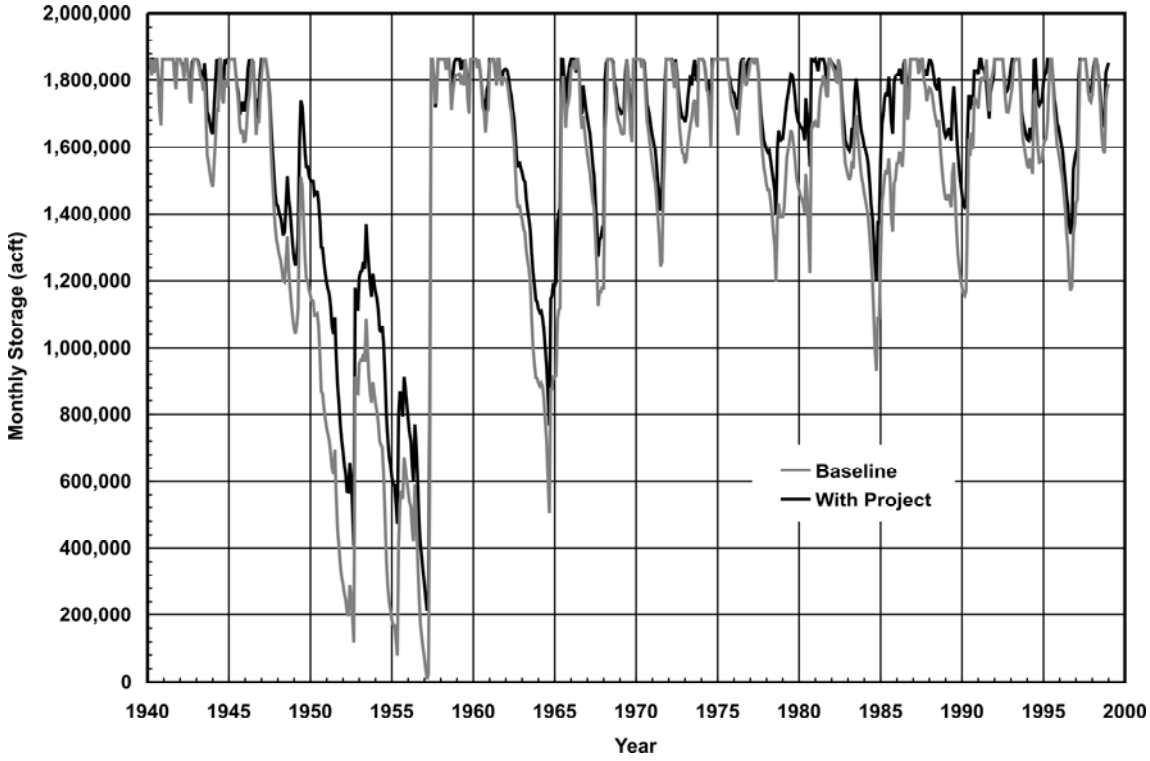

Figure 4C.9-4. LCRA-SAWS Water Project – Simulated Monthly Storage of LCRA System

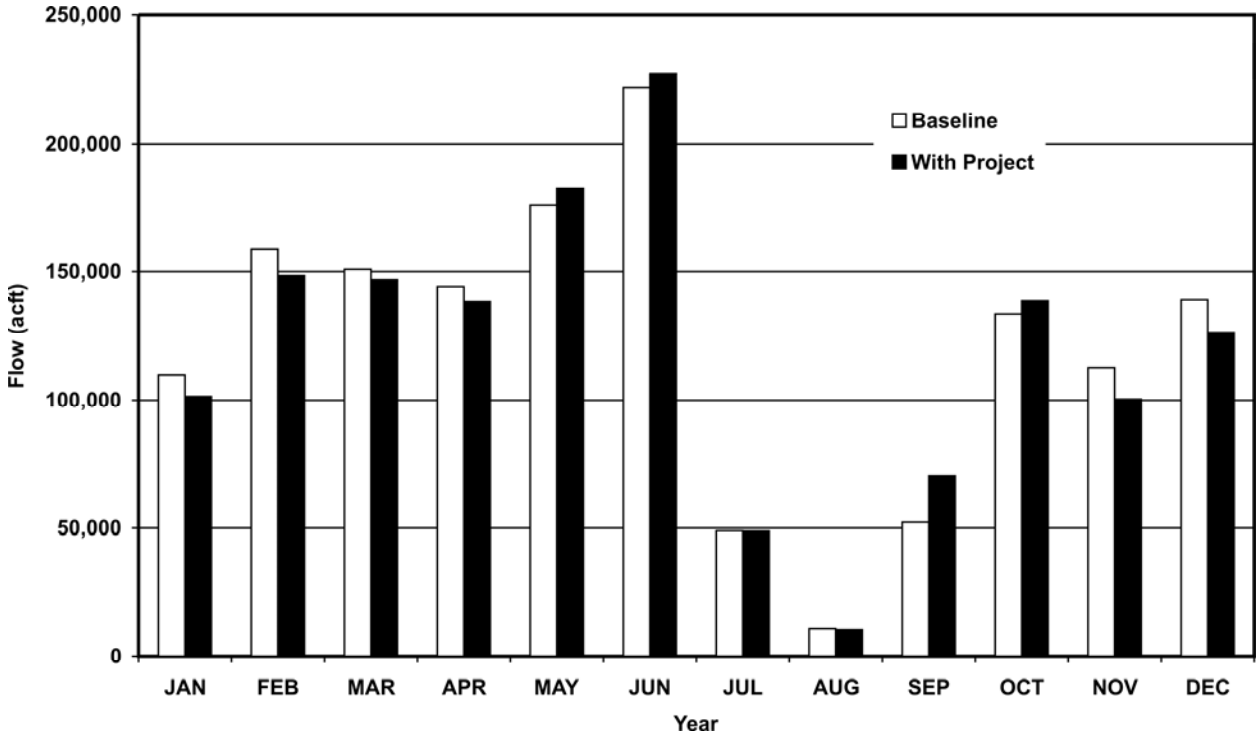

Figure 4C.9-5. LCRA-SAWS Water Project – Simulated Monthly Long-term Average Inflows to Matagorda Bay

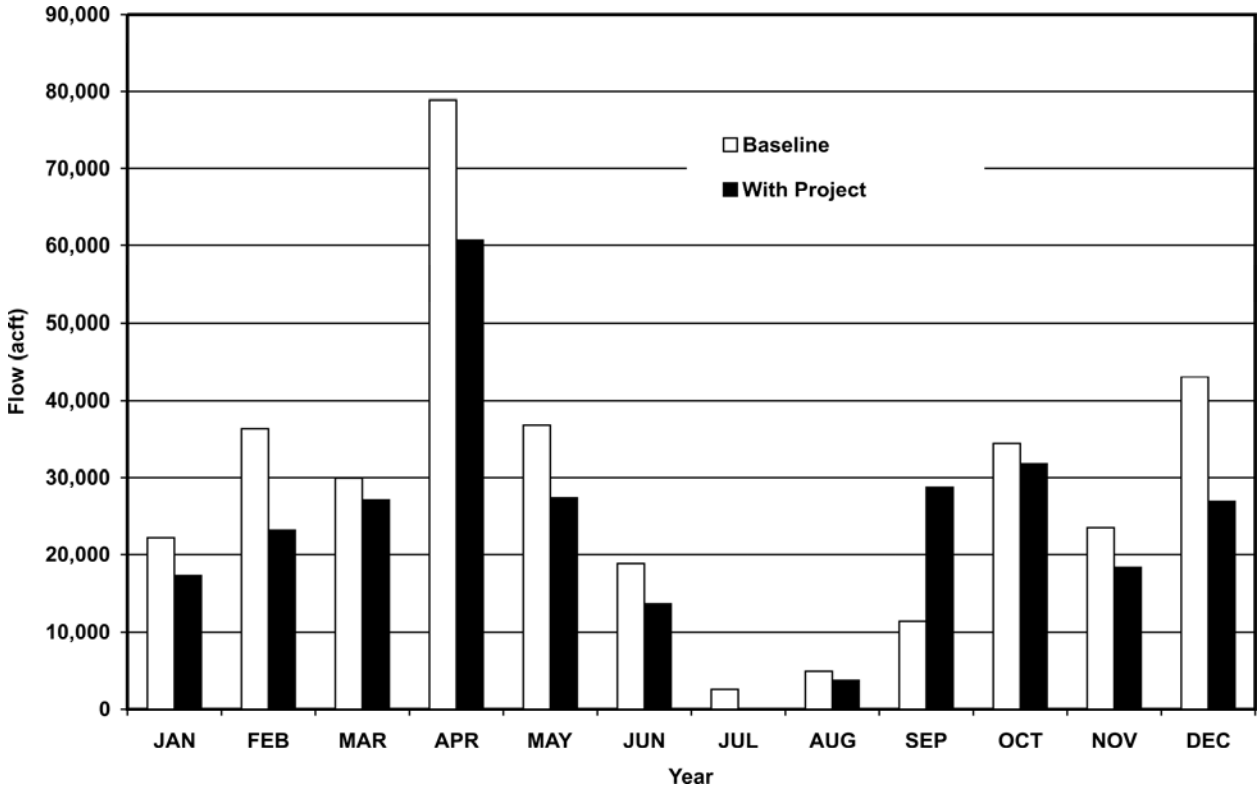

Figure 4C.9-6. LCRA-SAWS Water Project – Simulated Monthly Drought Average Inflows to Matagorda Bay

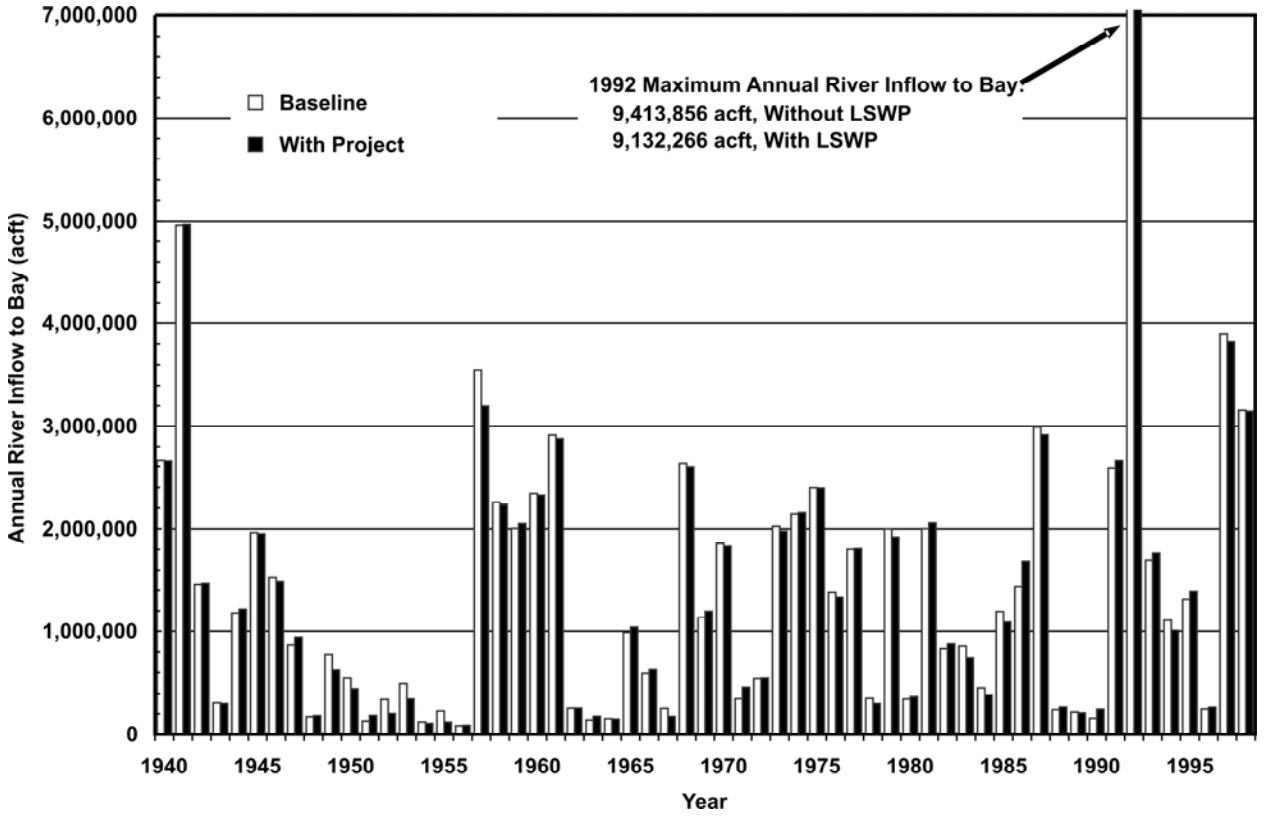

Figure 4C.9-7. LCRA-SAWS Water Project – Simulated Annual Inflows to Matagorda Bay

respectively. The largest long-term average decrease is 18,594 acft/month in December. The largest long-term average increase is 18,178 acft/month in September. Figure 4C.9-7 shows simulated annual inflows to Matagorda Bay for each year of the 1940-1998 simulation period. It is important to note that figures showing sources of water, lake levels, and streamflow changes have been provided by LCRA, SAWS, and their consultant(s). For more information on modeling assumptions, baseline conditions, and system operation, please contact LCRA or SAWS.

4C.9.3 Environmental Issues

This strategy is based on an agreement between SAWS and LCRA and involves the purchase of up to 150,000 acft/yr of surface water from the Lower Colorado River Basin. Facilities in this plan include intakes, pump stations, and a 250,000 acft off-channel storage facility potentially located in Colorado, Wharton, or Matagorda County, a 161-mile long

transmission pipeline to Bexar County, transmission booster stations, terminal storage, and expansion of the water treatment plant in Bexar County.

The water transmission pipeline between Bay City and the Twin Oaks Water Treatment Plant in Bexar County would be approximately 161 miles long[2]. The construction of the pipeline would include the clearing and removal of woody vegetation. The proposed pipeline route would traverse three of Omernik's[3] ecoregions: the Western Gulf Coastal Plain, the East Central Texas Plains, and the westernmost reaches of the Texas Blackland Prairie. These areas include the Tamaulipan and Texan biotic provinces.[4] A small central section of the pipeline corridor would traverse the Post Oak Savannah vegetational area, but the longest segments would be in the South Texas Plains and Coastal Prairies vegetational areas.[5] The climax vegetation of these three vegetational areas is considered to be post oak or live oak savannah and grassland, but much of the area presently consists of rangeland, small farms, and brushland, with woodlands tending to occur as remnant riparian strips.[6] In addition, the Guadalupe River, Arenosa Creek, and Garcitas Creek, all crossed by the transmission pipeline to Bexar County are listed by TPWD as an Ecologically Significant River and Stream Segments.

Plant and animal species in the project area listed by the USFWS, and TPWD as endangered or threatened are presented in Table 4C.9-1. All species listed have habitat requirements or preferences that suggest they could be present within the project area. Surveys for protected species should be conducted within the proposed construction corridors where preliminary evidence indicates their existence. Many of these species, such as the Texas Tortoise, the Texas Horned Lizard, and the Indigo Snake, are dependent on shrubland or riparian habitat. The Texas Garter Snake may be present in wetland habitat, and the Timber Rattlesnake, a threatened species, may be found in the riparian woody vegetation of the area. Destruction of potential habitat can be avoided by selecting a corridor through previously disturbed areas, such as croplands. Selection of a pipeline right-of-way alongside the existing habitat could also be beneficial to some wildlife by providing edge habitat; however, the majority of these areas are small and fragmented, so care should be taken to ensure minimum impacts.

[2] CH2MHill, "2005 Project Viability Assessment," Lower Colorado River Authority, October 2005
[3] Omernik, J.M., "Ecoregions of the Conterminous United States," Annals of the Association of American Geographers, 77:118-125, 1987.
[4] Blair, W. Frank, "The Biotic Provinces of Texas," Texas Journal of Science 2(1):93-117, 1950.
[5] Gould, F. W., "The Grasses of Texas," Texas A&M University Press, College Station, Texas, 1975.
[6] Ibid.

Table 4C.9-1. Important Species Having Habitat or Known to Occur in Counties Potentially Affected by the LCRA-SAWS Water Project*

Common Name	Scientific Name	Impact Value	Multiplier Based on Status	Adjusted Impact	Summary of Habitat Preference	Listing Entity		Potential Occurrence in County
						USFWS[1]	TPWD[1]	
American Eel	*Anguilla rostrata*	1	1	1	Moist aquatic habitats.			Resident
American Peregrine Falcon	*Falco peregrinus anatum*	0	3	0	Open country; cliffs	DL	E	Nesting/ Migrant
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	0	2	0	Open country; cliffs	DL	T	Nesting/Migrant
Atlantic Hawksbill Sea turtle	*Eretmochelys imbricata*	1	3	3	Gulf and bay system.	LE	E	Migrant
Attwater's Greater Prairie-Chicken	*Tympanuchus cupido attwateri*	2	3	6	Coastal Prairies of Gulf Coastal Plain	LE	E	Nesting
Bald Eagle	*Haliaeetus leucocephalus*	2	2	4	Large Bodies of water with nearby resting sites	LT-PDL	T	Nesting/Migrant
Big Red Sage	*Salvia penstemonoides*	2	1	2	Moist Creek and stream bed edges; historic; introduced in native plant nursery trade			Resident
Black Bear	*Usus americanus*	0	2	0	Mountains, broken country, woods, brushlands, forests	T/SA; NL	T	Resident
Black-capped Vireo	*Vireo atricapillus*	0	3	0	Semi-open broad-leaved shrublands	LE	E	Nesting/Migrant
Black-Spotted Newt	*Notophthalmus meridionalis*	1	2	2	Ponds and resacas in south Texas		T	Resident
Brown Pelican	*Pelecanus occidentalis*	0	3	0	Coastal inlands for nesting, shallow gulf and bays for foraging	LE	E	Nesting/Migrant
Cave Myotis Bat	*Myotis velifer*	0	1	0	Roosts colonially in caves.			Resident

Table 4C.9-1 continued

Bracted Twistflower	*Streptanthus bracteatus*	1	1	1	Endemic; Shallow clay soils over limestone; rocky slopes			Resident
Cagle's Map Turtle	*Graptemys caglei*	1	2	2	Endemic, Guadalupe River System.	C1	T	Resident
Correll's False Dragon-Head	*Physostegia correllii*	1	1	1	Wet soils			Resident
Coastal Gay Feather	*Liatris bracteata*	2	1	2	Black clay soils of midgrass grasslands on coastal prairie remnants.			Resident
Corkwood	*Leitneria floridana*	1	1	1	Small shrub, found in narrow zone between brackish marsh and freshwater areas.			Resident
Elmendorf's Onion	*Allium elmendorfii*	1	1	1	Endemic; deep sands derived from Queen City and similar Eocene formations			Resident
Creeper (Squawfoot)	*Strophitus undulatus*	1	1	1	small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins			Resident
Eskimo Curlew	*Numenius borealis*	1	3	3	Grasslands, pastures.	LE	E	Nonbreeding Resident
Golden-Cheeked Warbler	*Dendroica chrysoparia*	1	3	3	Woodlands with oaks and old juniper	LE	E	Nesting/Migrant
Green Sea Turtle	*Chelonia mydat*	1	2	2	Gulf and bay system.	LT	T	Migrant
Guadalupe Bass	*Micropterus treculi*	2	1	2	Clear flowing streams			Resident
Gulf Saltmarsh Snake	*Nerodia clarkii*	0	1	0	Brackish to saline coastal waters			Resident
Guadalupe Darter	*Percina sciera apristis*	1	1	1	Raceways of medium streams and rivers.			
Henslow's Sparrow	*Ammodramus henslowii*	1	1	1	Weedy fields, cut over areas; bare ground for running and walking			Nesting/Migrant
Indigo Snake	*Drymarchon corais erebennus*	1	2	2	Grass prairies and sand hills; usually thornbush woodland and mesquite savannah of coastal plain		T	Resident
Interior Least Tern	*Sterna antillarum athalassos*	1	3	3	Inland river sandbars for nesting and shallow water for foraging	LE	E	Nesting/Migrant
Jaguarundi	*Felis yagouaroundi*	0	3	0	South Texas thick brushlands, favors areas near water	LE	E	Resident
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	1	3	3	Gulf and bay system.	LE	E	Migrant
Keeled Earless Lizard	*Holbrookia propinqua*	1	1	1	Coastal dunes, Barrier islands and sandy areas			Resident
Leatherback Sea Turtle	*Dermochelys coriacea*	1	3	3	Gulf and bay system.	LE	E	Migrant

Table 4C.9-1 continued

Loggerhead Sea Turtle	*Caretta caretta*	1	2	2	Gulf and bay system.	LT	T	Migrant
Louisiana Black Bear	*Ursus americanus luteolus*	0	2	0	Within historical range.	LT	T	
Maculated Manfreda Skipper	*Stallingsia maculosus*	1	1	1	Fast erratic flight, larvae feed inside a leaf shelter, pupate in cocoon made of leaves & silk			Resident
Mountain Plover	*Charadrius montanus*	1	1	1	Non-breeding-shortgrass plains and fields, plowed fields and sandy deserts			Nesting/Migrant
Ocelot	*Felis pardalis*	1	3	3	Dense chaparral thickets; mesquite-thorn scrub and live oak mottes	LE	E	Resident
Parks' Jointweed	*Polygonella parksii*	2	1	2	South Texas Plains; subherbaceous annual in deep loose sands, spring-summer			Resident
Piping Plover	*Charadrius melodus*	0	2	0	Beaches and flats of Coastal Texas	LT	T	Migrant
Pistolgrip	*Tritogonia verrucosa*	1	1	1	stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins			Resident
Plains Gumweed	*Grindelia oolepsis*				Early successional patches in coastal prairie on heavy clay soils, sometimes in disturbed habitats in urban areas			Resident
Plains Spotted Skunk	*Spilogale putorius interrupta*	1	1	1	Prefers wooded, brushy areas and tallgrass prairie, fields, prairies, croplands, fence rows, forest edges			Resident
Red Wolf	*Canis rufus*	0	3	0	Extirpated.	LE	E	
Reddish Egret	*Egretta rufescens*	0	2	0	Coastal inlands for nesting, coastal marshes for foraging		T	Migrant
Runyon's Water Willow	*Justicia runyonii*	1	1	1	Openings in subtropical woodlands.			Resident
Rock-pocketbook	*Arcidens confragosus*	1	1	1	mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins			Resident
Sandhill Woolywhite	*Hymenopappus carrizoanus*	2	1	2	Endemic; Open areas in deep sands derived from Carrizo and similar Eocene formations			Resident
Sheep Frog	*Hypopachus variolosus*	1	2	2	Deep sandy soils of Southeast Texas		T	Resident
Smooth Green Snake	*Liochlorophis vernalis*	0	2	0	Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation		T	Resident

Table 4C.9-1 continued

Smooth Pimpleback	*Quadrula houstonensis*	1	1	1	small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins			Resident
Snowy Plover	*Charadrius alexandrinus*	0	1	0	Wintering Migrant on mud flats.			Migrant
Sooty Tern	*Sterna fuscata*	1	2	2	Catches small fish.			Resident
South Texas Siren (Lg. Form)	*Siren sp. 1*	1	2	2	Moist soils		T	Resident
Spot-Tailed Earless Lizard	*Holbrookia lacerata*	1	1	1	central & southern Texas; oak-juniper woodlands and mesquite-prickly pear			Resident
Texas Asaphomyian Tabanid Fly	*Asaphomyia texanus*	1	1	1	Found near slow-moving water, eggs laid on objects near water; larvae are aquatic, adults prefer shady areas; feed on nectar and pollen			Resident
Texas Diamondback Terrapin	*Malaclemys terrapin littoralis*	0	1	0	Bays, coastal marshes of the upper two-thirds of Texas Coast			Resident
Texas Fatmucket	*Lampsilis bract eata*	1	1	1	streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins			Resident
Texas Fawnsfoot	*Truncilla macrodon*				little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins			
Texas Garter Snake	*Thamnophis sirtalis annectens*	1	1	1	Varied, especially wet areas; bottomlands and pastures			Resident
Texas Horned Lizard	*Phrynosoma cornutum*	1	2	2	Varied, sparsely vegetated uplands, grass, cactus, brush		T	Resident
Texas Tortoise	*Gopherus berlandieri*	1	2	2	Open brush w/ grass understory; open grass/bare ground avoided; occupies shallow depressions at base of bush or cactus, underground burrows, under objects; active March through November		T	Resident
Threeflower broomweed	*Thurovia triflora*	1	1	1	Endemic, black clay soils.			Resident

Table 4C.9-1 continued

Timber Rattlesnake	*Crotalus horridus*	1	2	2	Floodplains, upland pine, deciduous woodlands, riparian zones, abandoned farms, dense ground cover		T	Resident
Welder Machaeranthera	*Psilactis heterocarpa*	2	1	2	Coastal prairie; Shrub-infested grasslands and open mesquite-huisache woodlands			Resident
Two-flower Stickpea	*Calliandra biflora*	2	1	2	Plant.			Resident
White-faced Ibis	*Plegadis chihi*	0	2	0	Prefers freshwater marshes.		T	Resident
West indian manatee	*Trichechus manatus*	0	3	0	Gulf and bay system; opportunistic, aquatic herbivore	LE	E	Migrant
White-tailed Hawk	*Buteo albicaudatus*	1	2	2	Coastal prairies, savannahs and marshes in Gulf coastal plain		T	Nesting/Migrant
Whooping Crane	*Grus americana*	0	3	0	Potential migrant	LE	E	Migrant
Wood Stork	*Mycteria americana*	0	2	0	Forages in prairie ponds, ditches, and shallow standing water formerly nested in TX		T	Migrant
Zone-tailed Hawk	*Buteo albonotatus*	1	2	2	Arid, open country including deciduous or pine-oak woodland; nests in various habitats and sites		T	Nesting/Migrant

[1] Texas Parks and Wildlife Department (TPWD), Unpublished 2005, March 2005, Data and Map Files of the Wildlife Science Research and Diversity Division maintained by TPWD, Austin, Texas.

- LE/LT=Federally Listed Endangered/Threatened
- E/SA, T/SA=Federally Listed Endangered/Threatened by Similarity of Appearance
- C1=Federal Candidate for Listing
- DL, PDL=Federally Delisted/Proposed for Delisting
- NL=not Federally Listed
- E, T=State Listed Endangered/Threatened
- PE, PT=Federally Proposed Endangered/ Threatened
- Blank = Rare, but no regulatory listing status

One endangered species known to exist near the pipeline corridor is the Attwater's Greater Prairie Chicken, which is found in Goliad and Victoria Counties. The Attwater's Greater Prairie Chicken prefers the coastal prairies grassland in area 0 to 24 inches in vegetation height. Many migratory birds are dependent on the quality of estuarine environments in order to complete the foraging and nesting of their migration. One of the most well known of the migratory birds found in the project area is the Whooping Crane (*Grus Americana),* which is listed as endangered by both USFWS and TPWD. Two other migratory birds known to the project area are listed as threatened by TPWD: the Reddish Egret (*Egretta rufescens*), and the Piping Plover (*Charadrius melodus*). The Piping Plover is also listed as threatened by USFWS.

A rookery has been identified near the pipeline route in Victoria County, and the threatened Bald Eagle (*Haliaeetus leucoephalus*) nests and uses habitat in Jackson County. The proposed pipeline route extends through about 2 miles of the Bald Eagle habitat. These predatory birds usually inhabit areas near large lakes or rivers.

Big red sage (Salvia penstemonoides), Two-flower Stickpea (Calliandra biflora), Coastal Gay Feather (*Liatris bracteata*), Plains Gumweed (*Grindelia oolepsis*), Elmendorf's Onion (*Allium elmendorfii*), Parks' Jointweed (*Polygonella parksii*), Threeflower Broomweed (*Thurovia triflora*) and Welder Machaeranthera (Psilactis heterocarpa) are all rare plants found in the project corridor. The Two-Flower Stickpea, Coastal Gay-feather and Parks' Jointweed are found within one mile of the proposed pipeline route. These three species are usually found in grassland habitats. The Big Red Sage grows in creek beds and seepage slopes of limestone canyons.

Field surveys conducted at the appropriate phase of development should be employed to minimize the impacts of construction and operation on sensitive resources. Specific project features, such as well field, pipelines, and off-channel reservoirs generally have sufficient design flexibility to avoid most impacts or significantly mitigate potential impacts to geographically limited Environmental and cultural resource sites.

Matagorda Bay is an estuarine environment dependent on freshwater inflows from the Colorado Rivers. Changes in streamflow in the Colorado River below a Bay City diversion were reported during the Project Viability Assessment for the LCRA-SAWS Water Project in November 2004. It was concluded that diversion of previously existing surface water from the Lower Colorado River Basin would not significantly alter the existing freshwater inflow regime of Matagorda Bay, or the existing dissolved oxygen levels in the Colorado River. The results of the environmental studies (water quality, river habitat, and bay health) have not revealed any "show stoppers" for the LSWP although the studies are in their early stages. It is expected that the ongoing studies will identify methods for designing and operating the LSWP to meet environmental needs as determined by legislative requirements, agency guidance, and/or permit conditions[7].

[7] Ibid.

Cultural resources protection on public lands in Texas is afforded by the Antiquities Code of Texas (Title 9, Chapter 191, Texas Natural Resource Code of 1977), the National Historic Preservation Act (Pl96-515), and the Archeological and Historic Preservation Act (PL93-291). Cultural resource occurrences within this project area are expected to be numerous due to the number of stream crossings along the pipeline route, and the known number of significant archaeological sites near Lake Texana, Victoria, and the Colorado River to name a few of the areas included by the project. Considering that the owner or controller of the project will likely be a political subdivision of the State of Texas (i.e. river authority, municipality, county, etc.), they will be required to coordinate with the Texas Historical Commission prior to project construction. If the project will affect waters of the United States or wetlands, the project sponsor will also be required to coordinate with the U.S. Army Corps of Engineers regarding impacts to cultural resources

4C.9.4 Engineering and Costing

As part of their agreement, SAWS and LCRA have prepared a Project Viability Assessment[8] (PVA) that is to be updated annually. The PVA includes five elements: water availability, water quality, impacts to Matagorda Bay, meeting the needs of local agricultural interests, and project cost. In order to be consistent with both the PVA study and the Region L costing procedures (Appendix A), cost estimates for the LSWP, using the Region L costing procedures have been provided by LCRA, SAWS, and their consultants[9]. Adjustments have been added to these costs to account for integration and associated project costs. The major facilities that would need to be constructed to divert, store, and deliver water from the Colorado River near Bay City to the Twin Oaks facility in south Bexar County and associated costs are summarized in Table 4C.9-2.

The diversion facilities for the off-channel storage facility would allow average flows to pass the transmission intake, while withdrawing excess flows for storage. When water is unavailable in the river for delivery, the off-channel storage facility would release water back into the river to be diverted at the downstream transmission intake. Additional information regarding operations of facilities may be found in the PVA.

[8] CH2MHill, "2005 Project Viability Assessment," Lower Colorado River Authority, October 2005
[9] LCRA, Electronic Communication, October 19, 2005

Table 4C.9-2.
Cost Estimate Summary for
LCRA-SAWS Water Project – Bay City to Bexar County
(Second Quarter 2002 Prices)

Item	*Region L Estimated Costs (2nd Quarter 2002 Prices)*
Capital Costs	
Colorado River Diversion Works	$230,476,000
Off-Channel Storage Facilities (1-250,000 acft facility)	$181,504,000
Primary Intake and Transmission Pump Stations (141 MGD)[1]	$39,810,000
Transmission Pipeline (90 in dia., 161 miles)	$384,239,000
Terminal Storage (25,000 acft)[2]	$40,300,000
Water Treatment Plant (141 MGD)[1]	$132,927,000
Integration[2]	$140,748,000
Well Field (59 Wells, 2000 GPM)	$49,961,000
Agriculture Conservation	$89,150,000
Total Capital Cost	**$1,289,115,000**
Engineering, Legal Costs and Contingencies (E, A, L, F, B, & C)[3]	$431,978,000
Environmental & Archaeology Studies and Mitigation	$12,080,000
Study Period Costs[4]	$27,700,000
Land Acquisition and Surveying	$19,979,000
Interest During Construction (4 years)	$288,161,000
Total Project Cost	**$2,069,013,000**
Annual Costs	
Debt Service (6 percent, 30 years)	$124,843,000
Reservoir Debt Service (6 percent, 40 years)	$23,299,000
Operation and Maintenance	
Pipeline and Pump Station[5]	$4,991,000
Dam and Reservoir[6]	$6,018,000
Water Treatment Plant	$12,291,000
Ag Conservation	$2,655,000
Well Field	$500,000
Pumping Energy Costs	$19,563,000
Purchase of Water (25% of 150,000 acft/yr @ $115/acft)	$4,700,000
Total Annual Cost	**$198,860,000**
Available Project Yield (acft/yr)	150,000
Annual Cost of Water ($ per acft)	$1,326
Annual Cost of Water ($ per 1,000 gallons)	$4.07

[1]Regional Planning costs procedure plans for a 5% downtime; the PVA estimates do not account for downtime.
[2]Cost estimate not provided in PVA – Region L cost used with CCI adjustments, where appropriate.
[3]E, A, L, F, B, & C = Engineering, Administration, Legal, Financing, Bonding, & Contingencies
[4]LSWP Study Period Costs in the PVA
[5]O&M for diversion works, wells, & off-channel reservoirs covered by Purchase of Water Cost.
[6]Reservoir O&M for Terminal Storage only. O&M for off-channel reservoirs covered by Purchase of Water Cost.

The 161-mile, 90-inch pipeline, would deliver water from the river at a uniform rate of 141 MGD (150,000 acft/yr with 5 percent downtime for maintenance) to the SAWS Twin Oaks facility, as shown in Figure 4C.9-1. The capital cost for this strategy is $1,289,115,000. With contingencies, land acquisition, interest during construction, engineering, legal costs, and other studies, the total project cost would be $2,069,013,000. Financing the non-reservoir portion of the project over 30 years at a 6 percent annual interest rate results in an annual cost of $124,843,000. Estimated cost for the off-channel reservoirs, financed at 6 percent for 40 years, is $23,299,000 annually. The annual costs, including debt repayment, interest, pumping energy, raw water purchases, and operation and maintenance, total $198,860,000. For an annual supply of 150,000 acft, the resulting annual cost of water of is $1,326 per acft/yr, or $4.07 per 1,000 gallons.

A preliminary estimate of cost for a potential alternative or additional diversion from the Colorado River at Bastrop for development of an 18,000 acft/yr water supply for water user groups in Caldwell and Hays Counties is included as Table 4C.9-3. As indicated in Table 4C.9-3, the total project cost for diversion, off-channel storage, transmission, and treatment facilities is $127,671,000. Annual costs including debt service, operations and maintenance, power, and water purchase total $20,599,000. For delivery of a firm supply of 18,000 acft/yr, the estimated unit cost of this potential project is $1,144/acft/yr.

Table 4C.9-3.
Cost Estimate Summary for
LCRA-SAWS Water Project – Bastrop to Hays County
(Second Quarter 2002 Prices)

Item	*Region L Estimated Costs (2nd Quarter 2002 Prices)*
Capital Costs	
Off-Channel Storage (10,000 acft)	$21,566,000
Intake and Pump Station	$21,485,000
Transmission Pipeline (30 in dia., 35 miles)	$19,770,000
Transmission Pump Station(s)	$3,675,000
Water Treatment Plant (16 MGD)	$18,106,000
Total Capital Cost	**$84,602,000**
Engineering, Legal Costs and Contingencies	$28,623,000
Environmental & Archaeology Studies and Mitigation	$2,277,000
Land Acquisition and Surveying (651 acres)	$2,692,000
Interest During Construction (2 years)	$9,477,000
Total Project Cost	**$127,671,000**
Annual Costs	
Debt Service (6 percent, 30 years)	$6,781,000
Reservoir Debt Service (6 percent, 40 years)	$2,282,000
Operation and Maintenance	
Intake, Pipeline, Pump Station	$819,000
Dam and Reservoir	$323,000
Water Treatment Plant	$1,536,000
Pumping Energy Costs (97,984,986 kW-hr @ 0.06 $/kW-hr)	$5,879,000
Agriculture & Groundwater Cost (Bastrop)	$900,000
Purchase of Water (18,000 acft/yr @ 115.5 $/acft)	$2,079,000
Total Annual Cost	**$20,599,000**
Available Project Yield (acft/yr)	18,000
Annual Cost of Water ($ per acft)	$1,144
Annual Cost of Water ($ per 1,000 gallons)	$3.51

4C.9.5 Implementation Issues

Institutional arrangements are needed to implement projects, potentially including financing on a regional basis.

Requirements for Purchase and Amendments to Existing Water Rights

1. Obtain TCEQ approval for amendments to the existing water rights to reflect:
   a. New type of water use.
   b. New diversion point.

c. Interbasin transfer.

2. Water sales contracts must be approved by the TCEQ.

Off-Channel Reservoir

1. Necessary permits for the off-channel storage reservoir could include:
   a. TCEQ Storage permit.
   b. USCE Sections 10 and 404 dredge and fill permits for the reservoir and pipelines.
   c. GLO Sand and Gravel Removal review.
   d. GLO Easement for use of state-owned land.
   e. Coastal Coordination Council review.
   f. TPWD Sand, Gravel, and Marl permit.
2. Permitting may require these studies:
   a. Assessment of changes in instream flow and freshwater inflows to bays and estuaries.
   b. Habitat mitigation plan.
   c. Environmental studies.
   d. Cultural resource studies.
3. Land must be acquired through either negotiations or condemnation.
4. Relocations for the reservoirs could include:
   a. County roads.
   b. Utilities.

Groundwater Well Field

1. Competition for groundwater in the area with others.
2. Potential regulations by local groundwater district(s).
3. Insufficient technical data and information on the hydrogeology and environment to make a comprehensive determination on the effects of pumping the Gulf Coast Aquifer for an extended period of time.

Requirements Specific to the Transmission Pipeline

1. Necessary permits:
   a. USCE Sections 10 and 404 dredge and fill permits for stream crossings.
   b. GLO Sand and Gravel Removal permits.
   c. TPWD Sand, Gravel and Marl permit for river crossings.
2. Right-of-way and easement acquisition.
3. Crossings:
   a. Highways and railroads.
   b. Creeks and rivers.
   c. Other utilities.