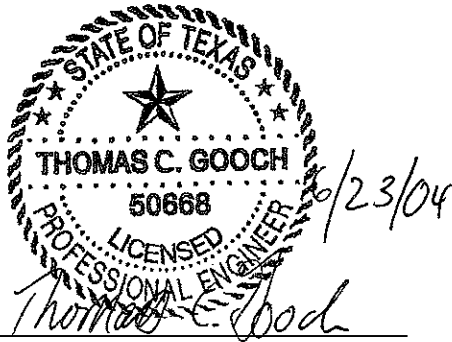


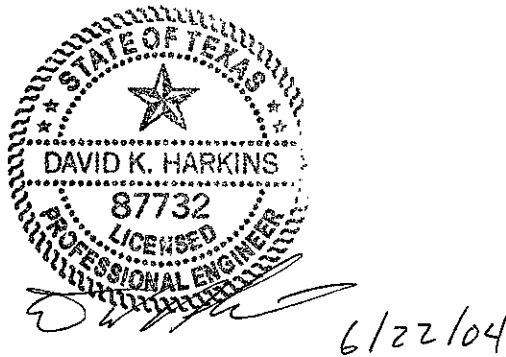
Report in Support of System Operation Permit Application - Executive Summary

June 22, 2004

Prepared for:
Brazos River Authority



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Brazos River Authority -
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Executive Summary

The Brazos River Authority (Authority) was created by the Texas Legislature in 1929 to develop and manage the water resources of the Brazos River Basin, the largest river basin in Texas. The Authority owns and operates four reservoirs (Possum Kingdom Lake, Lake Limestone, Lake Granbury and Lake Alan Henry) and has water rights in eight federal reservoirs (Lake Belton, Lake Stillhouse Hollow, Lake Proctor, Lake Whitney, Aquilla Lake, Lake Georgetown, Lake Granger and Lake Somerville). The Authority also has a share in the proposed Allens Creek Reservoir in Austin County. Altogether, the Authority has total authorized diversions of 796,551¹ acre-feet per year and total authorized storage of 2,484,419 acre-feet, which are about 34% of the total diversions and 60% of the total storage in the basin, respectively. In addition to the above priority rights, the Authority has a permit to divert, on a non-priority basis, up to 650,000 acre-feet per year of the unregulated, unappropriated flows of the Brazos River in Austin and Fort Bend Counties. Water diverted under this permit is assigned to an Authority reservoir for accounting purposes, although it is not actually released or diverted from a reservoir.

According to the 2002 State Water Plan, demands from Authority water resources will be approximately 882,000 acre-feet by 2050. Demands from the Authority's system will exceed the Authority's existing water rights between 2020 and 2030. With this application, the Authority is seeking additional appropriations to meet future water demands and operational flexibility to address its statutory mandate to manage water resources throughout the Brazos River Basin. Major items sought in this application include:

- A new appropriation of 421,449 acre-feet per year of state water for multiple uses, including domestic, municipal, agricultural, industrial, mining, and other beneficial uses on a firm basis, as well as the authorization to dedicate up to 90,000 acre-feet per year of this firm supply to develop up to 670,000 acre-feet per year of interruptible supply.
- Interbasin transfer authorization to transfer water to counties and municipalities partially in the basin and to adjacent coastal basins pursuant to Texas Water Code § 11.085 (v) (3) and (4).

¹ Authorized diversions include 35,000 acre-feet per year from Lake Alan Henry and 99,650 acre-feet per year from Allens Creek Reservoir. Lake Alan Henry is not part of the existing System Operation Order and the supply has been fully contracted to the City of Lubbock. The permit for Allens Creek Reservoir is jointly owned by the Authority, the Texas Water Development Board, and the City of Houston. Allens Creek Reservoir has not been built.

- Inclusion, as part of the appropriation described above, of an appropriation of current and future return flows to the extent that such return flows continue to be discharged or returned into the bed and banks of the Brazos River, its tributaries, and Authority reservoirs.
- Authorization for operational flexibility to (i) use any source of water available to the Authority to satisfy the diversion requirements of senior water rights to the same extent that those water rights would have been satisfied by passing inflows through the Authority's reservoir on a priority basis, and (ii) release, pump, and transport water from any of the Authority's reservoirs for subsequent storage, diversion, and use throughout the Authority's service area.
- Recognition that the System Operation Permit will prevail over inconsistent provisions in the Authority's existing water rights.
- Authorization to use the bed and banks of the Brazos River, its tributaries and Authority reservoirs for the storage, conveyance and subsequent diversion of water appropriated by this application and from other sources.

The Authority already has authorization by the Texas Commission on Environmental Quality (TCEQ) through the System Operation Order² to operate its reservoirs as a system. However, the System Operation Order does not appropriate the additional yield made available through system operation and contains several limitations that may prevent the Authority from efficiently operating its system.

Many factors need to be taken into account when managing a system as large and complex as the Authority's system. Once the System Operation Permit is approved, the Authority will develop a Water Management Plan. It is anticipated that the Water Management Plan will be regularly updated and submitted to the TCEQ for review and approval. This Water Management Plan will provide the same safeguards intended by special provisions and general limitations in existing Authority water rights, including some provisions of the System Operation Order, and will provide greater flexibility.

The authorizations sought in the System Operation Application are based on hydrologic analyses of the Brazos River Basin using the TCEQ Water Availability Model of the Brazos River Basin and San Jacinto-Brazos Coastal Basin (Brazos WAM). For the system operation analyses, the Brazos WAM was modified to incorporate system operation. Estimated 2060 return flows were incorporated into the model to evaluate the impact on

² Texas Water Commission: An Order Authorizing System Operation of Certain Reservoirs in the Brazos River Basin, July 23, 1964, amended 1968, 1977 and 1983.

potential yield. In the model, all water rights in the basin have access to return flows. Water rights with the most senior priority dates have first access to return flows. The System Operation Permit has the most junior priority date of any current water right in the basin, and therefore is limited to return flows remaining after exercise of all other water rights in the model.

Most alternatives for development of significant new water supplies in the Brazos River Basin involve construction of a considerable amount of new infrastructure. Achieving an equivalent amount of water supply would require construction of a large reservoir or extensive groundwater development, either of which may have significant environmental impacts and require a large capital investment. The System Operation Permit will require no infrastructure to make new yield available and minimal investment on the part of the Authority. Therefore, the System Operation Permit represents the most cost-effective and environmentally sensitive alternative for development of new water supplies in the Brazos River Basin.

The Authority is in the unique position of being able to develop this significant new supply through system operation. The additional yield that the Authority seeks to develop with the System Operation Permit depends on the efficient joint management of unappropriated flows in the river and reservoir storage. The Authority has far more reservoir storage available to contribute to system operation than any other water right holder in the basin. Therefore, the vast majority of the additional supplies sought in the System Operation Permit can only be developed and made available by the Authority through the full use of the Authority's reservoir system.

System operation is included in the 2001 Brazos G regional water plan as a strategy for the Authority. The System Operation Permit is consistent with existing regional plans as a large part of the future water supply needs in the Brazos River Basin and adjacent areas are projected to be supplied by the Authority. The System Operation Permit is an alternative to new Authority-sponsored water supply projects designed to meet those needs.

The Authority has prepared amendments incorporating the System Operation Permit for the existing Region G and Region H plans. The Authority will be working with Regions

B, C, G, H, and O in the current round of regional planning to have water from the System Operation Permit considered in future regional plans.

1 Background and Purpose of the System Operation Permit

1.1 Key Points

The Brazos River Authority (Authority) was created by the Texas Legislature in 1929 to develop and manage the water resources of the Brazos River Basin, the largest river basin in Texas.

The Authority owns and operates four reservoirs (Possum Kingdom Lake, Lake Limestone, Lake Granbury and Lake Alan Henry) and has water rights in eight federal reservoirs (Lake Belton, Lake Stillhouse Hollow, Lake Proctor, Lake Whitney, Aquilla Lake, Lake Georgetown, Lake Granger and Lake Somerville). In addition, the Authority has a share in the proposed Allens Creek Reservoir. Altogether, the Authority has total authorized priority diversions of 796,551 acre-feet per year.

According to the 2002 State Water Plan, demands from Authority sources will exceed the existing supply between 2020 and 2030.

The System Operation Permit will allow the Authority to develop a major new supply of water without construction of new reservoirs.

1.2 History and Purpose of the Brazos River Authority

The Brazos River Basin is the largest of the fifteen major river basins in Texas. With a contributing drainage area of 36,028 square miles, the basin includes about one-sixth of the state³. The water resources of the Brazos River Basin are vital to the future development of a large part of Texas. The Texas Legislature has given the Brazos River Authority (Authority) broad authority to manage the water resources of the basin. The Authority is the major water rights holder in the basin as well. In seeking appropriation of additional state water, reuse, and greater flexibility in administering its existing water rights, the Authority is seeking to use its unique position and legislative mandate to efficiently manage the water resources of this basin for the benefit of both water users and the environment. This report serves as a background for that application.

Figure 1.1 is a general map of the Brazos River Basin, showing the location of the reservoirs for which the Authority holds Texas water rights.

³ Townsend, George E., *Planning Report 30.1 Drainage Area Compilation*, U.S. Study Commission – Texas, November 1960.



Upper Basin

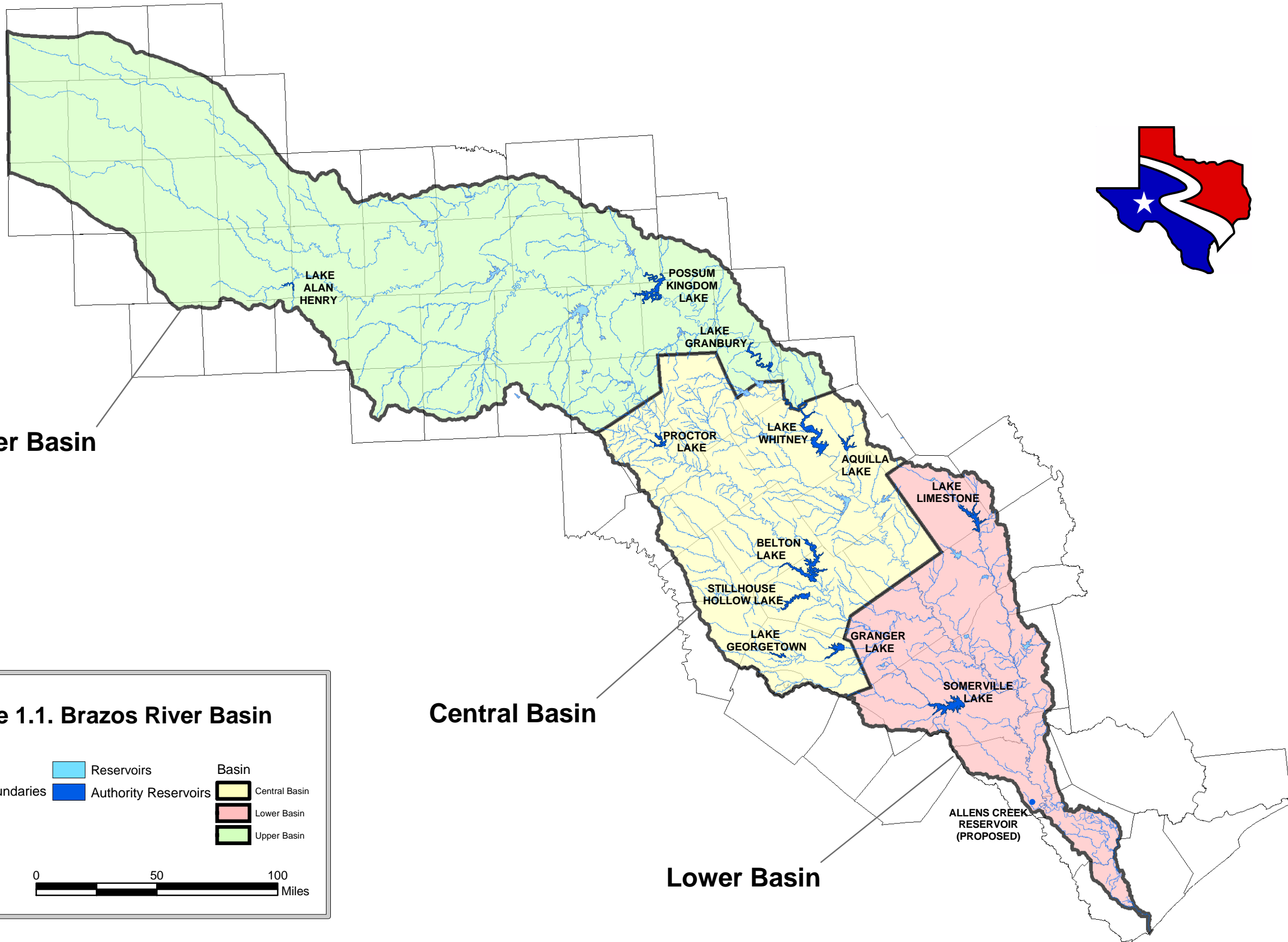
Central Basin

Lower Basin

Figure 1.1. Brazos River Basin

Rivers	Reservoirs	Basin
County Boundaries	Authority Reservoirs	Central Basin
		Lower Basin
		Upper Basin

0 50 100 Miles



In 1929 the Texas Legislature formed the Brazos River Conservation and Reclamation District, the first agency in the nation specifically created for the purpose of developing and managing the water resources of an entire river basin⁴. A partnership between the District and the Federal Government helped the District complete its first reservoir, Possum Kingdom Lake, for water supply and hydropower generation in 1941.

In 1953 the District obtained legislation changing its name to the Brazos River Authority. The legislation also provided the Authority with powers to issue bonds for irrigation and municipal water supply reservoirs in addition to flood control dams. Since then, the Authority completed Lake Granbury in 1969 and Lake Limestone in 1979, and constructed Lake Alan Henry in cooperation with the City of Lubbock in 1992.

As the U.S. Army Corps of Engineers (Corps) began to take the lead in flood control in the State, the Authority focused more on water supply for the basin. The Authority contracted with the Corps for conservation storage space in nine Corps reservoirs throughout the Brazos River Basin. Eight of these nine federal reservoirs (Lake Waco is not included) and the four reservoirs owned and operated entirely by the Authority are integrated into the Authority's basin-wide system of reservoirs.

Since 1971 the Authority has provided wastewater treatment services. Currently, the Authority owns or operates the Sugar Land Regional Sewerage System in Fort Bend County, the Temple-Belton Regional Sewerage System in Bell County, the Clute-Richwood Wastewater Facility in Brazoria County, and the Lee County Fresh Water Supply District #1 plant in Lee County. In 1995 the Authority entered into the Brazos-Colorado Water Alliance with the Lower Colorado River Authority (LCRA) to provide physical infrastructure and management services for a burgeoning population in Williamson County. The Alliance now provides wastewater services through the Brushy Creek Regional Wastewater System and the City of Hutto Wastewater Plant and surface water treatment for the city of Leander. The Authority has provided drinking water from the Lake Granbury Surface Water and Treatment System (SWATS) since 1989 and the Lee County Fresh Water District #1 system since 2002.

During the 1990s the Authority entered into an agreement with five entities in Williamson County to construct the 28-mile Williamson County Raw Water Pipeline to

⁴ "Who is the Brazos River Authority?" *The Brazos Basin*, Volume 1, Summer 2003.

move water from Lake Stillhouse Hollow to Lake Georgetown. In 2002, the Authority took advantage of changes in the petrochemical industry by acquiring a 77-mile water distribution system previously used to supply oil field flooding operations. This system, known as the West Central Brazos Water Distribution System, is expected to begin supplementing existing municipal supplies in Throckmorton and Shackelford Counties by 2005.

The Authority conducts studies to anticipate the need for and reduce the time required to develop future supplies or treatment systems. Projects such as the proposed Allens Creek Reservoir in Austin County and the Gulf Coast Desalination plant near Freeport are just two of the additional projects planned by the Authority to help provide for the future of the Brazos River Basin. The Authority also actively participates in ongoing regional water planning processes for Region O (High Plains), Region H (Houston area), and Region G (Central Texas).

Today, headquartered in Waco, the Authority functions under the direction of a general manager/CEO and a 21-member Board of Directors. The Authority currently has employees in a wide variety of fields, including engineers, hydrologists, biologists, economists, and legal experts. Together, these employees represent a significant pool of expertise available to manage the water resources of the Brazos River Basin.

The Brazos River Basin exhibits a wide variety of climatic, topographic and geographic conditions, ranging from the arid conditions of the upper basin to semi-tropical conditions in the lower basin. Reflecting the variety of water needs in the Brazos River Basin, the Authority is divided into three operating divisions – Upper, Central, and Lower. The boundaries of these operating divisions are shown in Figure 1.1.

Although the Authority is a governmental agency, it operates without benefit of appropriations from the State or Federal government, nor does it have taxing authority. Except for occasional government grants to pay for specific projects, the Authority is entirely self-supporting.

1.3 Description of the Existing Brazos River Authority System

The Authority holds water rights in eight reservoirs operated by the Corps of Engineers and four existing reservoirs that it owns and operates (Possum Kingdom,

Granbury, Limestone, and Alan Henry). The eight Corps of Engineers reservoirs are Lakes Aquilla, Belton, Georgetown, Granger, Proctor, Somerville, Stillhouse Hollow, and Whitney. Table 1.1 is a list of the reservoirs in the Authority system.

The Authority holds water rights for the proposed Allens Creek Reservoir jointly with the City of Houston and the Texas Water Development Board. The Authority also holds separate water rights allowing non-priority use of excess flow in the Brazos River Basin and interbasin transfers to the San Jacinto-Brazos coastal basin. Specifics of current Authority water rights are discussed in more detail in Chapter 2 of this report.

**Table 1.1
Reservoirs in the Brazos River Authority System**

Reservoir	County	Owner	Year Completed	Conservation Storage (Ac-Ft)	Permitted Diversion (Ac-Ft/Yr)
Alan Henry	Garza and Kent	Lubbock & Authority	1992	115,937	35,000
Poosum Kingdom	Palo Pinto	Authority	1941	724,739	230,750
Granbury	Hood	Authority	1969	155,000	64,712
Whitney	Hill & Bosque	Corps	1951	50,000 ^c	18,336
Aquilla	Hill	Corps	1983	52,400	13,896
Proctor	Comanche	Corps	1963	59,400	19,658
Belton	Bell	Corps	1954	457,600	112,257 ^b
Stillhouse Hollow	Bell	Corps	1968	235,700	67,768
Georgetown	Williamson	Corps	1980	37,100	13,610
Granger	Williamson	Corps	1980	65,500	19,840
Somerville	Burleson & Washington	Corps	1967	160,110	48,000
Limestone	Leon, Limestone & Robertson	Authority	1970	225,400	65,074
Allens Creek	Austin	Authority, Houston & TWDB	N/A ^a	145,533	99,650

a Allens Creek Reservoir has been permitted but has not been built.

b 12,000 ac-ft/yr for the U.S. Department of the Army and 100,257 ac-ft/yr for the Authority

c Total conservation storage of Lake Whitney is 642,179 acre-feet. The Authority has contracted only 50,000 acre-feet of storage with the Corps of Engineers, and the Authority's water right for the reservoir authorizes storage of 50,000 acre-feet between the elevations 520 feet and 533 feet (the power pool of the reservoir).

1.4 Purpose of the Proposed System Operation Permit

According to the 2002 State Water Plan, demands from Authority sources will exceed the existing supply between 2020 and 2030. With this application, the Authority is seeking additional appropriations to meet future demands and operational flexibility to address its legislated mandate to manage water resources throughout the Brazos River Basin.

The System Operation Permit represents a major new supply of water without construction of new reservoirs. It is fully consistent with the Authority's legislative mandate to manage the water resources of the Brazos River Basin. Chapter 2 of the report gives additional detail on what is being sought in the System Operation Permit.

1.5 Water Conservation to Ensure Beneficial Use of Water

The Authority is actively involved in efforts to encourage and increase water conservation in the Brazos River Basin. Copies of the current Authority Water Conservation Plan and the draft Drought Contingency Plan currently under development may be found in Attachment No. 4 of the *Supplemental Information for Brazos River Authority's Application for a System Operation Permit*⁵. Water conservation plans are required in all water supply contracts with the Authority. In addition, the Authority will provide technical expertise in water conservation to assist its customers in implementing water conservation strategies.

The Authority's Water Conservation and Drought Contingency Plans are likely to undergo revisions when rules for House Bills 2660 and 2663 are available. Draft rules for implementing this legislation have been published and made available for public comments. The comment period closed on May 24, 2004. It is also quite likely that the proposed Authority Water Management Plan will substantially alter the structure and methods used in the current policies, requiring revisions as well.

1.6 Concluding Remarks and Description of Report

The Authority has a long history and wide range of experience in managing water resources in the Brazos River Basin. The Authority controls most of the raw water supply infrastructure in the basin as well. The System Operation Permit is consistent with the

⁵ Bickerstaff, Heath, Smiley, Pollan, Kever & McDaniel, L.L.P.: *Supplemental Information for Brazos River Authority's Application for a System Operation Permit*, prepared for the Brazos River Authority, June 18, 2004.

legislative mandate of the Brazos River Authority to develop, manage and conserve the water resources of the Brazos River Basin⁶.

The remainder of this report contains supplemental technical information supporting the application. Chapter 2 describes the proposed System Operation Permit in detail. Other information may be found in the June 14, 2004 *Report in Support of System Operation Permit Application*.

⁶ Texas Water Code, Title 6, Surface Water Authorities, Subtitle B, Local Law Surface Water Authorities, Chapter 221.

2 Description of the Application

2.1 Key Points

The Authority holds 15 water rights in the Brazos River Basin, 13 of which are associated with reservoirs. These permits authorize total priority diversions of 796,551 acre-feet per year and a combined impoundment of 2,484,419 acre-feet, about 34% of the total authorized diversions and 60% of the storage in the Brazos River Basin.

The existing Authority System Operation Order and Excess Flows permit allow the Authority to operate most of their water supply sources as a system within certain restrictions. However, these water rights do not appropriate the additional supplies generated from this type of operation.

The application includes the following:

- A new appropriation of 421,449 acre-feet per year of state water for multiple uses, including domestic, municipal, agricultural, mining, industrial, and other beneficial uses on a firm basis, as well as the authorization to dedicate up to 90,000 acre-feet per year of this firm supply to develop up to 670,000 acre-feet per year of interruptible supply.
- Interbasin transfer authorization to transfer water to counties and municipalities partially in the basin and to adjacent coastal basins pursuant to Texas Water Code § 11.085 (v) (3) and (4).
- Inclusion, as part of the appropriation described above, of an appropriation of current and future return flows to the extent that such return flows continue to be discharged or returned into the bed and banks of the Brazos River, its tributaries, and Authority reservoirs.
- Authorization for operational flexibility to (i) use any source of water available to the Authority to satisfy the diversion requirements of senior water rights to the same extent that those water rights would have been satisfied by passing inflows through the Authority's reservoirs on a priority basis, and (ii) release, pump, and transport water from any of the Authority's reservoirs for subsequent storage, diversion, and use throughout the Authority's service area.
- Recognition that the System Operation Permit will prevail over inconsistent provisions in the Authority's existing water rights.
- Authorization to use the bed and banks of the Brazos River, its tributaries and Authority reservoirs for the storage, conveyance and subsequent diversion of water appropriated by this application and from other sources.

The Authority is seeking authorization to fulfill its legislative mandate to efficiently manage the limited water resources of the Brazos River Basin. Many factors need to be taken into account when managing these resources. To address these issues the Authority will develop a Water Management Plan. It is anticipated that the Water Management Plan will be updated regularly, and submitted to the TCEQ for review and approval.

2.2 Description of Existing Brazos River Authority Water Rights

The Authority holds 15 water rights in the Brazos River Basin, 13 of which are associated with reservoirs. These permits authorize total priority diversions of 796,551 acre-feet per year, which is about 34% of the total diversions in the Brazos River Basin, and impoundment of 2,484,491 acre-feet, which is 60% of the storage in the basin. In addition to the authorized diversions, the Lake Alan Henry permit allows 21,000 acre-feet of reuse for agricultural purposes of return flows from water diverted from the reservoir. The major provisions of these water rights are summarized in Table 2.1. Figure 2.1 shows the location of Authority water rights in the basin.

Figures 2.2 and 2.3 compare the priority dates of authorized diversions and storage of Authority rights to the other rights in the Brazos River Basin. The oldest rights in the Brazos River Basin date to the 1880s. The oldest significant diversions are associated with water rights owned by the City of Waco in 1914 and the City of Temple in 1915. The Authority's most senior priority date, April 6, 1938, is associated with Possum Kingdom Lake. The most junior Authority right, September 1, 1999, is associated with Allens Creek Reservoir, which is not yet built. Most of the permits have a priority date in the 1960s.

Lake Alan Henry, Possum Kingdom Lake, Lake Granbury and Lake Limestone are owned and operated by the Authority. The proposed Allens Creek Reservoir will be owned by the Authority, the Texas Water Development Board, and the City of Houston. The remaining Authority reservoirs are owned by the U.S. Army Corps of Engineers. Of these Corps reservoirs, the Authority is the sole water right holder with the exception of Lake Belton, in which the water rights are shared with the Fort Hood Army Base. The two remaining permits are associated with use of excess flows in the Brazos River Basin and interbasin transfer of water released from Authority reservoirs.

**Table 2.1
Summary of Brazos River Authority Water Rights**

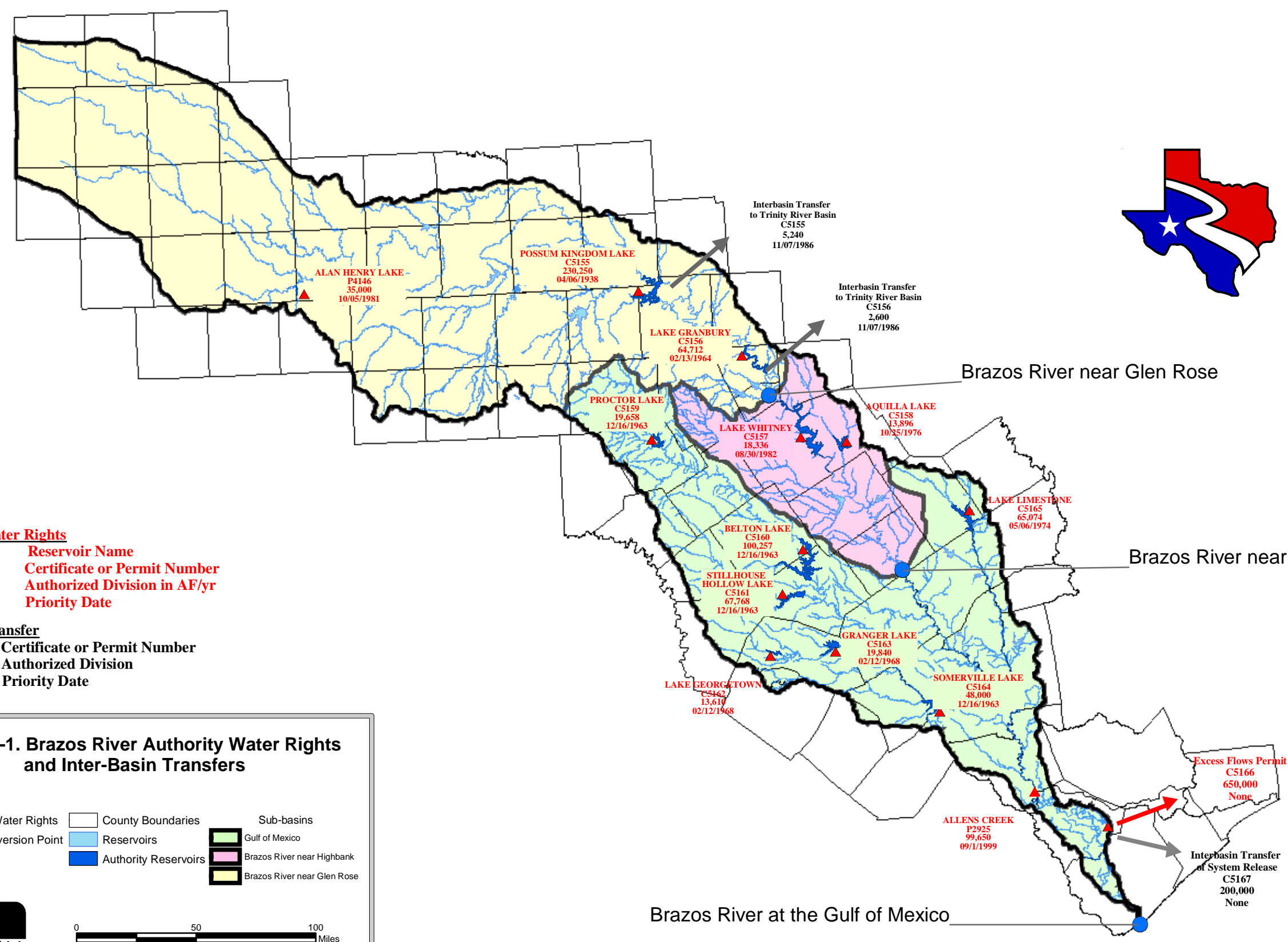
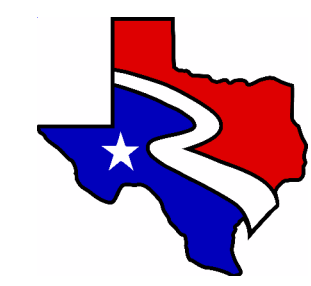
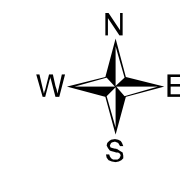
Water Right	Reservoir or Source	Storage (Ac-Ft)	County	Stand-alone Reservoir Permit (Priority Authorization)			Maximum Authorized Diversion under the System Operation Order			
				Priority	Amount (Ac-Ft/Yr)	Max Rate (cfs)	Priority	Amount	Use	
P 4146	Alan Henry	115,937	Lubbock, Lynn, Garza & Kent	10/5/1981	35,000	69.6 cfs			Mun	
				10/5/1981	Reuse of 21,000 of the 35,000 diverted for municipal use	Unspecified			Reuse (Irr)	
CA 5155	Possum Kingdom	724,739	Palo Pinto	4/6/1938 ^a	230,750 ^a	Unspecified	None	175,000 ^a	Mun	
								250,000	Irr	
								250,000	Ind	
								49,800	Min	
			None		Unspecified	--	--	Hydro		
CA 5156	Granbury	155,000	Hood	2/13/1964 ^b	64,712 ^b	Unspecified	None	40,000 ^b	Mun	
								14,500	Irr	
								45,000	Ind	
								500	Min	
CA 5157	Whitney	50,000 ^c	Hill and Bosque	8/30/1982	18,336	5,000 cfs	None	25,000	Mun	
							None	25,000	Ind	
CA 5158	Aquilla	52,400	Hill	10/25/1976	13,896	2,100 cfs through dam	None	17,000	Mun	
						90 cfs from reservoir		None	18,200	Ind
								None	200	Min
CA 5159	Proctor	59,400	Comanche	12/16/1963.	19,658	Unspecified	None	18,000	Mun	
								17,800	Ind	
								18,000	Irr	
								200	Min	
CA 5160	Belton	457,600	Bell	12/16/1963	100,257	Unspecified	None	95,000	Mun	
								150,000	Ind	
								149,500	Irr	
								500	Min	
CA 5161	Stillhouse Hollow	235,700	Bell	12/16/1963	67,768	Unspecified	None	74,000	Mun	
								74,000	Ind	
								73,700	Irr	
								300	Min	
CA 5162	Georgetown	37,100	Williamson	2/12/1968	13,610	Unspecified	None	16,500	Mun	
								16,400	Ind	
								4,100	Irr	
								100	Min	
CA 5163	Granger	65,500	Williamson	2/15/1968	19,840	Unspecified	None	30,000	Mun	
								29,800	Ind	
								5,500	Irr	
								200	Min	

Table 2.1 (continued)

Water Right	Reservoir or Source	Storage (Ac-Ft)	County	Stand-alone Reservoir Permit (Priority Authorization)			Maximum Authorized Diversion under the System Operation Order ^a			
				Priority	Amount (Ac-Ft/Yr)	Max Rate (cfs)	Priority	Amount	Use	
CA 5164	Somerville	160,110	Burleson and Washington	12/16/1963	48,000	Unspecified	None	49,500	Mun	
								50,000	Ind	
								50,000	Irr	
								500	Min	
CA 5165	Limestone	225,400	Leon, Limestone and Robertson	5/6/1974 for 217,494 ac-ft 9/4/1979 for 7,906 ac-ft.	65,074	Unspecified	None	69,500	Mun	
								77,500	Ind	
								70,000	Irr	
								500	Min	
P 2925	Allens Creek	145,533	Austin	9/1/1999	202,000 from Brazos, 99,650 from reservoir ^d	2,200 from Brazos, 300 cfs from reservoir			Mun, Ind, Irr,	
Total from reservoirs		2,484,419			796,551					
CA 5166	Excess flows	--	Austin, Brazoria, Fort Bend, Galveston and Harris	None ^c	100,000	3,200 cfs combined rate at four diversion points				Mun
					450,000					Ind
					100,000					Irr
CA 5167	Interbasin transfer of system releases ^a	--	Fort Bend	None	30,000	Two diversion points: 440 cfs at Churchill Fulcher Grant, and 467 cfs at Thomas Barnett Grant				Mun
					170,000					Ind

CA Certificate of Adjudication number
P Permit number

- a CA 5155 authorizes transfer to the Trinity Basin of up to 5,240 acre-feet of the municipal diversions with a priority date of 11/7/1986.
- b CA 5156 authorizes transfer to the Trinity Basin of up to 20,000 acre-feet of the municipal diversions with a priority date of 11/7/1986.
- c Charged to Authority reservoirs in priority order.
- d The water right for Allens Creek Reservoir is jointly owned by the City of Houston, the Brazos River Authority, and the Texas Water Development Board.
- e Storage in Lake Whitney is between elevations 520 and 533 feet mean-sea-level.



Authority Water Rights

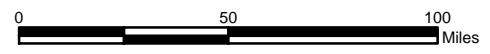
Proctor Lake	Reservoir Name
C5759	Certificate or Permit Number
19,658	Authorized Division in AF/yr
12/16/1963	Priority Date

Interbasin Transfer

C5156	Certificate or Permit Number
2,600	Authorized Division
11/7/1986	Priority Date

Figure 2-1. Brazos River Authority Water Rights and Inter-Basin Transfers

- ▲ Authority Water Rights
- Primary Diversion Point
- ~ Rivers
- County Boundaries
- Reservoirs
- Authority Reservoirs
- Sub-basins
 - Gulf of Mexico
 - Brazos River near Highbank
 - Brazos River near Glen Rose



Brazos River at the Gulf of Mexico

Figure 2.2
Comparison of Total Authorized Diversions in the Brazos River Basin to
Authorized Authority Diversions by Priority Date

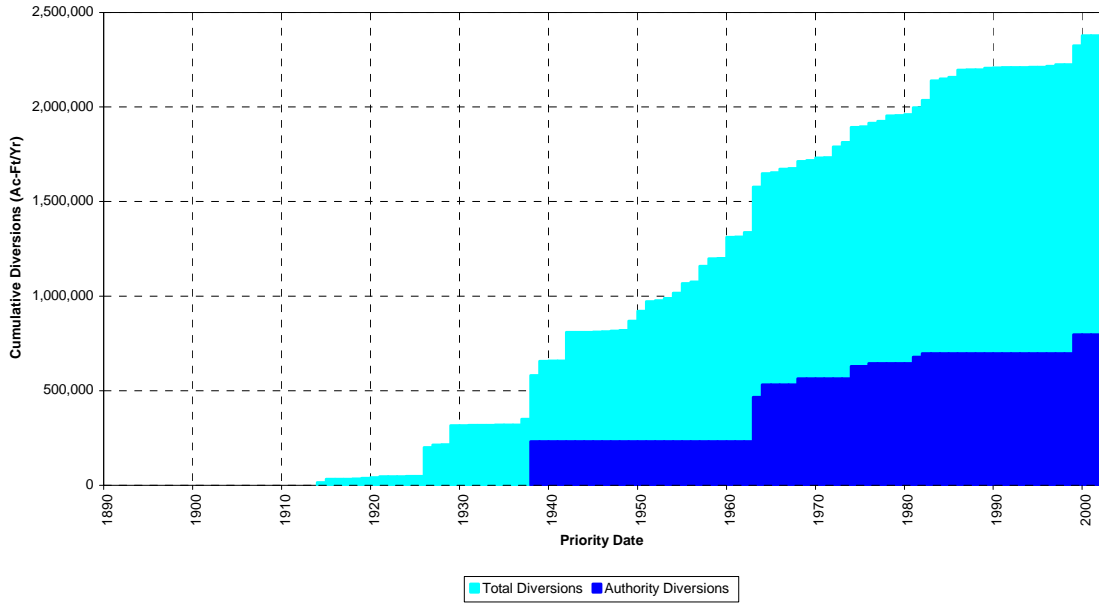
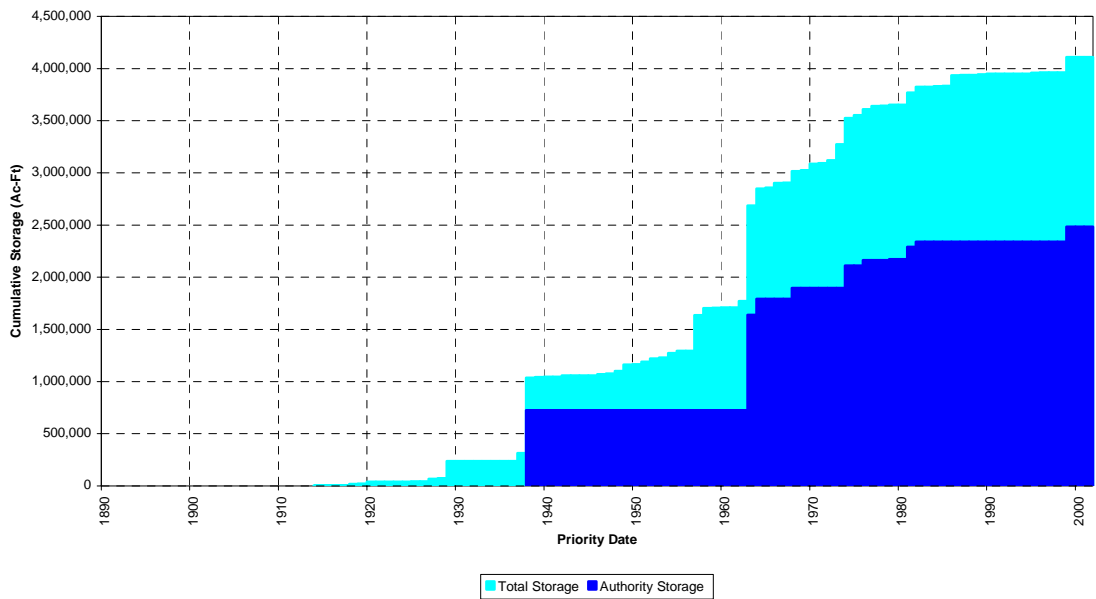


Figure 2.3
Comparison of Total Authorized Storage in the Brazos River Basin to
Authorized Authority Storage by Priority Date



A key feature of many of the Authority's water rights is the System Operation Order⁷ which allows coordinated operation of all the Authority's reservoirs except Lake Alan Henry and Allens Creek Reservoir. The System Operation Order allows the Authority to:

- Use the bed and banks of the Brazos River to deliver water to downstream customers.
- Release or divert water on a non-priority basis from any system reservoir in excess of its priority diversion up to a specified limit in each reservoir.
- Make use of unappropriated flows in the lower basin, again on a non-priority basis.

The System Operation Order has several restrictions, including:

- Total diversions are limited to the total priority authorization of the system reservoirs, currently 661,901 acre-feet per year⁸.
- Each reservoir has a specified annual limit for the amount of water available for overdraft, identified by type of use (municipal, agricultural, etc.).
- If a reservoir is less than 30% capacity and other system reservoirs are more than 30% capacity, that reservoir may not be used for system operation until all reservoirs are below 30% capacity.

Non-priority use of unappropriated flows is authorized by Certificate of Adjudication 5166, known as the 'Excess Flows' permit. This water right allows the Authority to divert, on a non-priority basis, up to 650,000 acre-feet per year of the unregulated, unappropriated flows in Austin and Fort Bend Counties. Any water diverted under this water right must be assigned to the Authority reservoir covered by the System Operation Order which has the most senior priority date. Water is not actually diverted or released from the reservoir; it is only assigned to that reservoir for accounting purposes. Although this right allows the Authority to make use of unregulated flows, it does not allow any supply benefit for the Authority system by having access to such flows.

2.3 Additional Rights Sought in Current Application

The existing System Operation Order allows the Authority some flexibility in the operation of its reservoir system, and the excess flows permit allows access to unappropriated flows in the lower portion of the basin without actually releasing water from Authority reservoirs. However, the existing water rights do not allow the Authority to take full advantage of the potential operational efficiencies and additional yield available from system

⁷ Texas Water Commission: An Order Authorizing System Operation of Certain Reservoirs in the Brazos River Basin, July 23, 1964, amended 1968, 1977 and 1983.

⁸ The System Operation Order does not include Lake Alan Henry or Allens Creek Reservoir.

operation. These two goals, additional yield from the system and more efficient operation, can be met without new infrastructure and with negligible impact on other water rights holders in the Brazos River Basin. Finally, the additional appropriations sought by the Authority can only be developed and made available by the Authority through the full use of the Authority reservoir system.

Specifically, in the application for a System Operation Permit the Authority is seeking the following:

- A new appropriation of 421,449 acre-feet per year of state water for multiple uses, including domestic, municipal, agricultural, mining, industrial, and other beneficial uses on a firm basis, as well as the authorization to dedicate up to 90,000 acre-feet per year of this firm supply to develop up to 670,000 acre-feet per year of interruptible supply.
- Interbasin transfer authorization to transfer water to counties and municipalities partially in the basin and to adjacent coastal basins pursuant to Texas Water Code § 11.085 (v) (3) and (4).
- Inclusion, as part of the appropriation described above, of an appropriation of current and future return flows to the extent that such return flows continue to be discharged or returned into the bed and banks of the Brazos River, its tributaries, and Authority reservoirs.
- Authorization for operational flexibility to (i) use any source of water available to the Authority to satisfy the diversion requirements of senior water rights to the same extent that those water rights would have been satisfied by passing inflows through the Authority's reservoirs on a priority basis, and (ii) release, pump, and transport water from any of the Authority's reservoirs for subsequent storage, diversion, and use throughout the Authority's service area.
- Recognition that the System Operation Permit will prevail over inconsistent provisions in the Authority's existing water rights.
- Authorization to use the bed and banks of the Brazos River, its tributaries and Authority reservoirs for the storage, conveyance and subsequent diversion of water appropriated by this application and from other sources.

Each of these subjects is discussed in more detail in the following sections.

2.3.1 New Appropriation of State Water

For the purposes of this report, water availability was evaluated at the three points listed in Table 2.2 and shown in Figure 2.1.

Table 2.2
System Yield Evaluation Locations

Location	WAM Control Point	USGS Gauge Number
Brazos River near Glen Rose	BRGR30	08091000
Brazos River near Highbank	BRHB42	08098290
Brazos River at the Gulf of Mexico	BRGM73	none

The hydrologic evaluations used as the basis for this application were performed using the TCEQ’s water availability model for the Brazos River Basin (Brazos WAM), modified to perform system operation. Table 2.3 summarizes the additional water appropriation requested at the three analysis points.

Table 2.3
Additional Appropriations
Available through System Operation by Subbasin
(Values in Acre-Feet per Year)

Scenario	Subbasin	Additional Firm Supply from System Operation without Interruptible Supplies	Additional Supply from System Operation with Interruptible Supplies ^b		
			Firm Supply	Interruptible Supply	Total Supply
Without Allens Creek Reservoir ^a	Glen Rose	150,538	60,538	190,000	250,538
	Highbank	175,306	85,306	284,000	369,306
	Gulf of Mexico	425,099	335,099	869,000	1,024,099
With Allens Creek Reservoir ^a	Glen Rose	150,538	60,538	157,000	217,538
	Highbank	144,306	54,306	303,000	357,306
	Gulf of Mexico	421,449	331,449	670,000	1,001,499

a With 2060 return flow conditions and Lyons bypass criteria

b Interruptible supply meets the 75/75 criteria.

Allens Creek Reservoir is a project located in the lower Brazos River Basin that will be part of the Authority system. The project has been permitted but has not yet been constructed. According to the 2001 Region H regional water plan, this reservoir will be built between 2010 and 2020⁹. The entries under “Without Allens Creek Reservoir” in Table 2.3

⁹ Brown & Root/Turner Collie & Braden: *Task 5 Report: Identification, Evaluation, and Selection of Water Management Strategies*, prepared for the Region H Water Planning Group, February 2001.

show the amount of water requested for authorization in the System Operation Permit until such time as Allens Creek Reservoir is built and operating.

Once Allens Creek Reservoir is constructed it will be a key part of the Authority system. The reservoir's location in the lower portion of the basin makes it able to capture and store unappropriated flows and gives the Authority added operational flexibility. The Authority plans to partner with the City of Houston to use the entire storage and diversions from the reservoir as part of the system.

Table 2.3 shows the requested appropriation for both firm and interruptible water. Firm water can be reliably supplied from a reservoir through a repeat of the most hydrologically severe drought in the historical record. Interruptible water may be curtailed during extended dry periods. The Authority is requesting authorization to dedicate up to 90,000 acre-feet per year of the firm yield of system operation to generate interruptible supply. By devoting a portion of the system's firm water supply towards development of a larger, interruptible water supply, the Authority can greatly enhance the overall water supply capabilities of the system.

Interruptible water is normally used for irrigated agriculture or other purposes that do not require a reliable source of water. However, under some circumstances interruptible water is appropriate for use for municipal or industrial supplies. Interruptible water may be appropriate for municipal and industrial purposes if another surface water source or groundwater source is available to replace the interruptible supplies when they are curtailed.

2.3.2 Authorization to Appropriate Current and Future Return Flows

The yields shown in Table 2.3 include the authorization for a new appropriation of current and existing return flows discharged or returned into the bed and banks of the Brazos River, its tributaries and the Authority's reservoirs. Return flows represent a significant potential water supply in the Brazos River Basin. The Authority's right to use such water would have a 2004 priority date, the same date as the rest of the System Operation Permit. As a result, other existing water rights holders would continue to be able to access these

return flows as part of their water supply, improving the reliability of these rights. The System Operation Permit would not prevent direct reuse of effluent by others¹⁰.

2.3.3 Operational Flexibility

Texas water law is based on the prior appropriations doctrine, often summarized as ‘first in time first in right.’ Each water right is given a priority date which governs the order in which water is allocated during times of shortage. For older rights, the priority date is based on the first beneficial use of the water. For newer rights, the priority is based upon the date in which the application was declared administratively complete by the TCEQ. A right with an older priority date is referred to as a ‘senior right’, while a right with a more recent priority date is called a ‘junior right’. The Authority’s water rights have priority dates ranging from April 6, 1938, for Possum Kingdom Lake to September 1, 1999, for Allens Creek Reservoir.

Strictly following the prior appropriation doctrine, a priority call by a senior water right can only be met from a junior water right. However, from an overall system viewpoint, this may not be the most efficient way to manage the Authority’s water resources. The Authority is requesting the operational flexibility to allow the Authority to pass through or release water from any part of the Authority system to satisfy downstream senior demands to the extent that they would have been satisfied by a priority call on a junior Authority water right, regardless of the priority of the rights or source of water used by the Authority to satisfy the downstream senior demand. This flexibility will allow the Authority to efficiently manage its supplies by using more plentiful supplies to satisfy downstream water rights while conserving less plentiful supplies.

The Little River watershed is a good example of how this might benefit the Authority’s customers. This watershed includes the Temple-Belton area and Williamson County, which is the location of many of the Authority’s customers and a high growth area. The reservoirs that supply this area (Lakes Proctor, Belton, Stillhouse Hollow, Georgetown and Granger) all have priority dates in the 1960s. It would be desirable to maximize the yield of these reservoirs. If the Authority is granted this operational flexibility, a senior demand on

¹⁰ Texas Administrative Code Title 30 Chapter 297 Subchapter E Rule §297.42(g), available on line at <http://www.sos.state.tx.us/tac/index.shtml>.

the main stem of the Brazos River could be met from passage of inflows or releases from storage from other reservoirs in the Authority system rather than from releases of inflows from Little River watershed reservoirs. This would reserve water for future use within the Little River watershed.

The Authority is also seeking the right to move water from storage in its reservoirs to storage in other reservoirs or for use in the Authority's service area. For example, this would allow the Authority to meet needs from a nearby reservoir and refill storage in that reservoir with water diverted or released from other Authority projects. This sort of flexibility is needed to optimize system operation.

2.3.4 System Operation Inconsistencies in the Authority's Existing Water Rights

There are several provisions based on the System Operation Order in the Authority's existing water rights that are inconsistent with the proposed System Operation Permit. The provisions relate to the use of water for multiple purposes, the percentage of reservoir storage allowed to be used in system operations and identification of sources of water supply. These provisions prevent the Authority from making optimal use of its water resources. The application includes a request for language specifying that provisions in the System Operation Permit prevail over inconsistent provisions in the Authority's existing water rights. The proposed Water Management Plan described in section 2.4, which will be updated regularly and approved by the TCEQ, will provide the same safeguards intended by such provisions in existing Authority water rights.

2.3.5 Bed and Banks Authorization

The Authority provides water to a variety of customers located throughout the Brazos River Basin. A large portion of this water is delivered via the bed and banks of the Brazos River and its tributaries. The use of the bed and banks is authorized in all of the Authority's existing water rights, the System Operation Order, and the Authority's enabling legislation. This application for a System Operation Permit requests bed and banks authorization to transport the additional water appropriated under the System Operation Permit, as well as water from other sources. Specifically, the Authority requests authorization to use the bed

and banks of the Brazos River and its tributaries and Authority reservoirs for the conveyance, storage, and subsequent diversion of:

- Water that the Authority seeks to appropriate under the System Operation Permit
- Waters that are being conveyed via pipelines or other water transmission systems and subsequently discharged into the Brazos River and its tributaries or stored in the Authority's reservoirs
- Surface water and groundwater imported from areas located outside of the Brazos River Basin for subsequent use
- In-basin surface water and groundwater subject to the Authority's control
- Water developed from new Authority projects

In all cases, the Authority would be allowed to divert only the amount of water put into a watercourse or stream less allowances for losses, if any.

2.3.6 Interbasin Transfer Authorization

Under Texas water law, a transfer of water from one river basin to another river basin requires authorization by the state. Interbasin transfer authorization requires basin-wide notice and additional analyses regarding the basin of origin and the receiving basin. Also, a water right authorizing interbasin transfer is junior in priority to all other water rights granted before the time the application for the interbasin transfer is accepted for filing.

Texas water law recognizes exemptions from most of the above mentioned requirements for the transfer of water to adjacent coastal basins or to counties or municipalities or municipality's retail service areas that are partially within the basin of origin for use in that part of the county, or municipality or municipality's retail service area not within the basin of origin¹¹. In this application, the Authority requests interbasin transfer authorization under these exemptions for use of water in the San Jacinto-Brazos Coastal Basin and the Brazos-Colorado Coastal Basin, and for use outside the Brazos River Basin to any county, municipality or the retail service area of a municipality that is partially within the Brazos River Basin.

¹¹ Texas Water Code § 11.085(v)(3)&(4), available on line at <http://www.capitol.state.tx.us/statutes/statutes.html>.

2.4 Implementation of the System Operation Permit – Water Management Plan

In this application for a System Operation Permit, the Authority is seeking authorization to fulfill its legislative mandate to manage the water resources of the Brazos River Basin. The application is more than just a request for additional water supply. Meeting the future water needs of the State of Texas requires balancing between managing water supplies and protecting cultural and natural resources. For any other entity to develop a significant surface water supply project in the Brazos River Basin would require the construction of a new reservoir, which is expensive and can have adverse environmental and cultural impacts. The System Operation Permit requires no additional infrastructure to generate a new supply of water. The additional reliable supply made available by system operation can only be created by use of the Authority's reservoir storage. The System Operation Permit will give the Authority the ability to manage its resources efficiently, consistent with the Authority's legislative directive to manage the water of the Brazos River Basin. The System Operation Permit is also consistent with the State's policy of optimal development of our limited water resources.

The analysis used to determine the yield of the three subbasins assumes that the same amount of water is taken every year at the most downstream point in the subbasin, which tends to maximize the potential yield of the water supply. Reality is more complex. Authority customers are not located at these three diversion points, and demands are not constant year after year. Some Authority customers take their water directly lakeside. Others take their water from the Brazos River, relying on releases from upstream reservoirs during low-flow periods. Some customers may be supplied by multiple sources in the Authority system, while others can only be supplied by one or two sources. Some customers have large contracts for which they are only currently using a small amount, reserving supplies for the future. Other customers may need to increase their contract amounts as their demand grows. Some customers only buy supplemental water for use during dry conditions, while other customers get their water solely from the Authority. Overall, the interaction of these water supply factors, along with environmental and cultural impacts, must be taken into account when managing the system.

In order to address the issues associated with the implementation of the System Operation Permit, the Authority will undertake development of a Water Management Plan for the Authority system. Because the Water Management Plan will potentially be of interest to other water users in the basin, as well as the general public, the Authority plans to solicit public input in the development and periodic revision of the plan. The Water Management Plan will be submitted to the TCEQ for review and approval and will be updated on a regular basis. The Water Management Plan will allow the Authority to optimize its system operation and use the rights and flexibility granted by the System Operation Permit. The Water Management Plan will also give TCEQ an on-going review of Authority operations to assure that the flexibility granted in the System Operation Permit is used wisely and that other water rights and the environment are fully protected. The Water Management Plan would address issues such as:

- Given the location and type of current Authority contractual commitments, how much water can be supplied through operation of the Authority system?
- Where can additional water supplies be delivered?
- How should diversions under the System Operation Permit and the Authority's existing water rights be accounted for and reported to TCEQ?
- Has new information been developed on channel losses in the Brazos River and its tributaries? If so, how should the revised information be incorporated in the operation of the system?
- Has new information been developed on environmental flow needs in the Brazos River and its tributaries? If so, how should the revised information be incorporated in the operation of the system?
- How can the Authority's system be operated to maintain and improve water quality in the Brazos River Basin and the quality of water delivered to customers?
- How does the current water supply available from the Authority's system compare with current contractual commitments and projected demands? What additional water supplies are needed? Where and how might such water supplies be developed?
- How can the Authority's system best be operated on a real-time basis to maximize available supplies, protect environmental values, and ensure reliability?
- How can the Authority's system be managed to minimize salt water intrusion in the lower basin during low-flow periods?