8.4 West Central Brazos Water Distribution System

8.4.1 Description of Option

The West Central Brazos Water Distribution System (WCBWDS) is a relatively unused system that could potentially provide raw water to a large portion of the upper Brazos River Basin area. The WCDWDS pipeline facilities, which are owned by the Brazos River Authority (BRA), consist of an intake and pump station east of Breckenridge. The facilities currently provide raw water for industrial use to the area west of Possum Kingdom.

The BRA has received requests from numerous area water suppliers interested in purchasing raw water from Possum Kingdom Lake that could be conveyed through the WCBWDS facilities. Albany, Breckenridge, Eastland County WSD, Graham, Shackelford WSC, Stephens Regional SUD (formerly named Stephens County Rural WSC) and West Central Texas MWD have all expressed interest in obtaining water from the BRA. As part of the West Central Brazos Study[1], a hydraulic analysis of the WCBWDS was conducted and improvements were identified to move water to different participants. Three scenarios were evaluated: 1) existing industrial demands, 2) short-term requests, and 3) long-term requests. These amounts from the West Central Brazos Study are shown in Table 8.3-1.

The hydraulic study found that with only pump station improvements and some additional pipeline capacity, the WCBWDS facilities could have sufficient capacity to serve the existing customers and the near-term request for water. With the addition of a booster station and a 27-inch parallel pipeline, the facilities could serve additional supply to West Central Texas MWD, Eastland County WSD, the City of Graham, and the City of Albany. The WCBWDS pipeline could provide water to 20 or more entities.

For the 2016 Plan, the transport of water from Possum Kingdom Lake using the WCBWDS is being considered for the Midway Group participants: Shackelford Water Supply Corporation (WSC), Stephens Regional SUD, the City of Throckmorton and the City of Breckenridge. The Midway Group provides much of the water in Shackelford, Stephens and Throckmorton Counties. Primary water sources for the group include Hubbard Creek Reservoir, Lake Daniel, Lake Throckmorton and a contract with the City of Albany, which receives water from Hubbard Creek Reservoir and Lake McCarty. The Water User Groups (WUGs) participating in the Midway Group have access to sufficient supplies to meet TWDB demand projections (demand projections for Shackelford WSC were not estimated by the TWDB because it is not a WUG), but are limited in their capability to accommodate demands that are substantially greater than TWDB projections. Additionally, encountering a drought worse than the drought of record could reduce available supplies to less than projected demands. To meet potential needs of the Midway Group, this strategy proposes to transport water from Possum Kingdom Lake to the Stephens Regional SUD water treatment facility near Breckenridge via the WCBWDS, and distributed using existing facilities, upgraded proposed facilities and new

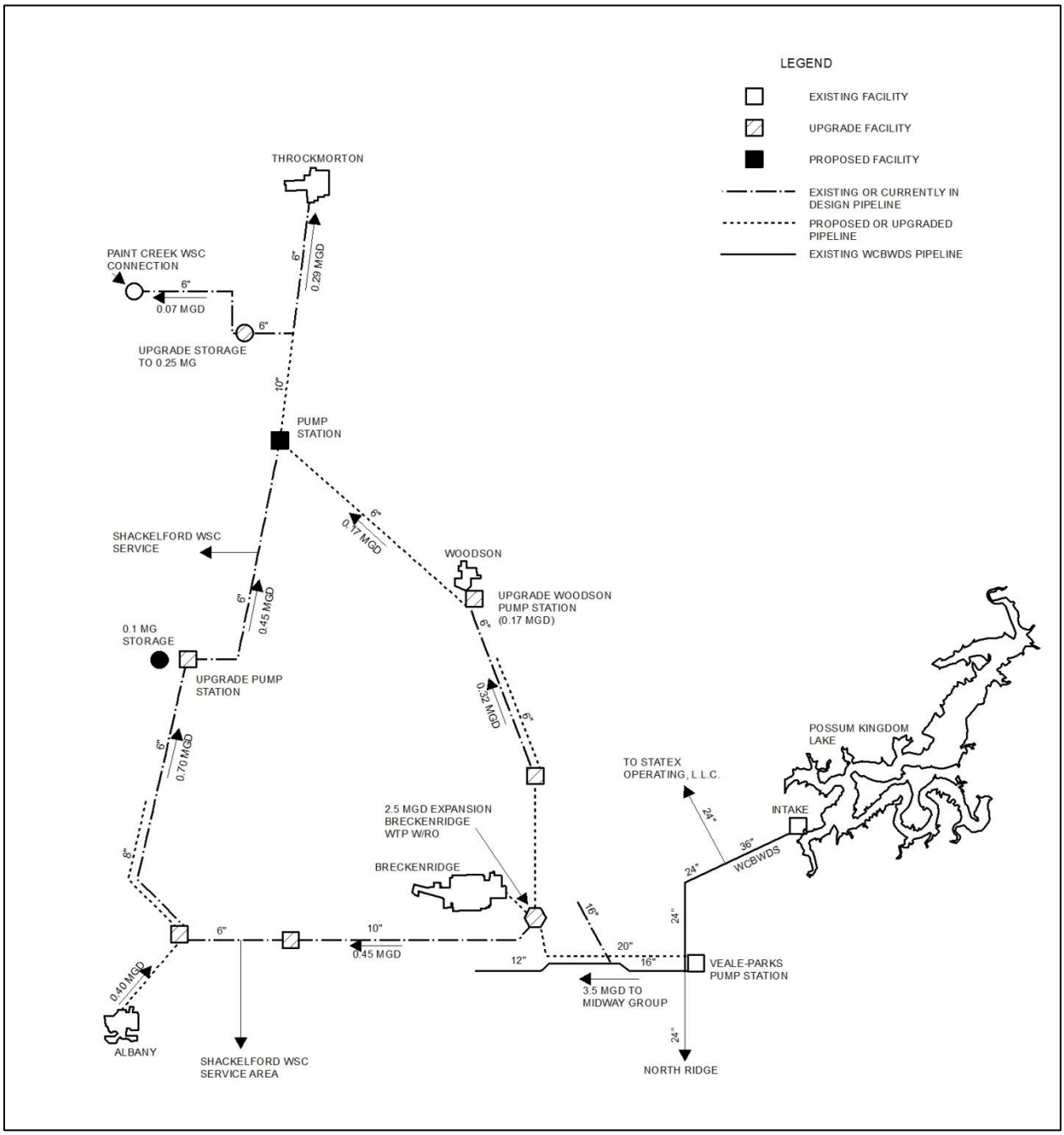
[1] Freese and Nichols, *West Central Brazos River Basin Regional Water Treatment and Distribution Facility Plan,* August 2004.

facilities to increase supplies and service currently unserved areas. Figure 8.4-1 presents a general schematic of the proposed improvements required for this strategy.

Table 8.4-1 Demands for WCBWDS Hydraulic Analyses

Water User	Demand (MGD)	Cumulative Demand (MGD)
Existing Industrial Demands	2.12	2.12
Near-Term Requests	6.42	8.54
Shackelford		
Breckenridge		
Stephens Regional SUD		
Throckmorton		
Mining		
Long-Term Requests	18.96	27.50
Albany		
WCTMWD		
Eastland County WSD		
Graham		
Stephens Regional SUD		

Figure 8.4-1 Schematic of Midway Group Interconnections Using the WCBWDS Facilities (Not to Scale)



8.4.2 Available Yield

This strategy assumes that the Midway Group participants would contract with the BRA for a total raw water supply of 2,000 acft/yr. This strategy would be provided supply under the BRA System Operation permit (See Section 7.12), currently pending at the Texas Commission on Environmental Quality. The System Operations permit would need to be successful obtained by the BRA before this strategy could be implemented. Assuming 30 percent of this supply is lost as reject water during treatment (desalination),

the available treated supply is approximately 1,400 acft/yr. The total projected demand for the group is about 1,600 acft/yr for the planning period.

The WCBWDS would be used to move the 2,000 acft/yr of water from Possum Kingdom Lake to the regional water treatment plant. Hydraulic analyses of this pipeline found that a new 20-inch pipeline and some pump station improvements were needed to meet the peak demands of the BRA's current customers and the Midway Group. To treat the water, the existing water treatment plant at Breckenridge would be expanded with a 2.5 MGD microfiltration and reverse osmosis facility. Alternatively, a new water treatment plant could be built solely for treating water from Possum Kingdom Lake. The reject water could possibly be discharged to evaporation beds, brine disposal well, to the WCBWDS pipeline for delivery to on-going oil field water flood operations, or by other means. Details of the proposed upgrades are shown in Figure 8.4-1 and available supplies to each participant are discussed below.

- **Throckmorton County.** This strategy proposes to supply the City of Throckmorton with 193 acft/yr by upgrading Shackelford WSC's planned expansion into Throckmorton County and utilizing existing and new water lines in the Stephens Regional SUD system. This is sufficient to meet the City's full demands of 182 acft/yr in 2020.
- **Shackelford County.** Of the remaining supply, approximately 250 acft/yr of treated water would be provided to Shackelford WSC, 400 acft/yr to Stephens Regional SUD and 550 acft/yr to Breckenridge to supplement current contracted supplies. The water for Shackelford WSC would be taken south of Breckenridge and transported through the Shackelford WSC's system to a proposed in-line pump station along Highway 180. The water would then be conveyed to the WSC's office pump station where it could be blended with water from the City of Albany and transported to an existing booster pump station near Fort Griffin. From there, water would be distributed to Shackelford WSC's customers and the City of Throckmorton. This scenario requires approximately 11.5 miles of upgrades to existing or planned water lines, upgrades of 5 pump stations and several new facilities. Some of these improvements are already proposed to serve retail customers of Shackelford WSC.
- **Stephens County.** Stephens Regional SUD would take treated water directly from the new regional water treatment plant. New connections to their existing distribution facilities would be needed. Some upgrades to Stephens Regional SUD system as shown in Figure 8.4-1 are also necessary to move water to Throckmorton and expand service to retail customers. These improvements include nearly 13 miles of new 6-inch pipeline and upgrades to Stephens Regional SUD's two existing pump stations. No additional improvements are proposed for the existing Breckenridge facilities.

8.4.3 Environmental Issues

The environmental impacts are expected to be low for the transmission improvements and system upgrades. Most of the upgrades are to existing or proposed pipelines. It is assumed that new pipelines can be routed around environmentally sensitive areas, as needed. Environmental impacts for the reject water from the treatment facility could be low to moderate, depending on the selected

disposal method. Further study is needed on the disposal options and potential impacts. There would be minimal impacts to Possum Kingdom Lake from this strategy. The quantity of water represents a small amount of the total yield of the reservoir, and would have little impact on water levels or downstream flows. A summary of environmental issues is presented in Table 8.4-2.

Table 8.4-2 Environmental Issues Midway Group Option using the WCBWDS

Water Management Option	Infrastructure improvements to supply water from Possum Kingdom Lake to entities in Stephens, Shackelford and Throckmorton Counties (Midway Group).
Implementation Measures	Upgrading of existing pipelines and pump stations to move water from a regional water treatment plant near Breckenridge to users in a 3-county area. Includes 2.5 MGD expansion of water treatment plant with microfiltration to treat brackish water from Possum Kingdom Lake.
Environmental Water Needs / Instream Flows	Negligible impacts to Possum Kingdom Lake. Potential impacts to water quality if brine effluent is discharged to surface water streams.
Bays and Estuaries	Negligible impact
Fish and Wildlife Habitat	Negligible impact from upgrade of infrastructure since most of the infrastructure is in place. Possible low to moderate impacts if brine effluent is discharged to surface water streams.
Cultural Resources	Negligible impact
Threatened and Endangered Species	Low to moderate impacts to threatened or endangered species depending on specific locations of pipelines and disposal option of brine effluent.
Comments	Impacts from brine discharge will be evaluated and mitigated during the permitting process

8.4.4 Engineering and Costing

Facilities required for the Midway Option using the WCBWDS to deliver treated water to its customers in Stephens, Shackelford, and Throckmorton Counties include:

- Water treatment plant expansion (with microfiltration)
- Pump station upgrades
- Transmission pipeline, and
- Elevated storage tank upgrades

The total project costs for this strategy are estimated at $21.2 million, which includes upgrades to the WCBWDS pipeline and a 2.5 MGD water treatment facility. The cost for treated water would be $7.65 per 1,000 gallons. The capital and annual costs are shown in Table 8.4-3. Water would be purchased from the BRA at the system rate at the time the contract is enacted. This water supply is dependent on the BRA successfully obtaining the System Operations permit.

Table 8.4-3 Estimated Cost for the Midway Group Interconnections (September 2013 Dollars)

Item	Estimated Costs
Capital Costs	
Intake and Pump Station Improvements	$1,284,000
Upgrade existing and new Transmission Pipeline (31 miles)	$5,791,000
Water Treatment Plant (2.5 MGD)	$7,619,000
Total Capital Cost	$14,694,000
Engineering, Legal Costs and Contingencies	$4,853,000
Environmental & Archeological Studies and Mitigation	$493,000
Land Acquisition and Surveying (12 acres)	$53,000
Interest During Construction (1.5 years)	$1,055,000
Total Project Cost	$21,148,000
Annual Costs	
Debt Service (5.5 percent, 20 years)	$1,770,000
Operation and Maintenance	$1,475,000
Pumping Energy Costs (@ $0.09/kWh)	$135,000
Purchase of Water (2000 acft/yr @ $54.50/acft)	$109,000
Total Annual Cost	$3,489,000
Available Project Yield (acft/yr)	1,400
Annual Cost of Water ($ per acft)	$2,492
Annual Cost of Water ($ per 1,000 gallons)	$7.65

8.4.5 Implementation Issues

Stephens Regional SUD received $5.8 million in total TWDB assistance through the DWSRF program to construct a surface water treatment plant near the City of Breckenridge and water lines to connect four of the districts pressure planes. The District currently purchases treated water from Breckenridge through a contract that will expire in 2015. The District has entered into a raw water purchase agreement with the Brazos River Authority to buy water from Possum Kingdom Reservoir.

This water supply option has been compared to the plan development criteria, as shown Table 8.4-4 the option meets each criterion. A major issue facing this option is that full participation of the identified entities may be critical to having an economically feasible project. Utilization of the WCBWDS will require infrastructure improvements that will need to be financed by the water users. Significant increases in the cost of water associated with the infrastructure improvements and water purchase can impede implementation, especially for smaller entities with limited financial resources.

The other major implementation issues are potential water quality concerns associated with the treatment and disposal of the elevated salts in the water from Possum Kingdom Lake. The Midway Group Regional WTP is proposed to treat Possum Kingdom water using reverse osmosis (or other comparable method). This will generate a brine reject stream that will require disposal. Options considered include discharge to the Brazos River, deep well injection, oil field flooding, or evaporation ponds. Depending on the disposal option, the cost of disposal and the time needed to obtain necessary permits will vary. For any discharge to state waters, a Texas Pollutant Discharge Elimination System Permit would be needed. This permit is issued by TCEQ and requires demonstration of no to low impacts to the water quality of the receiving stream. Permits for deep well injection are granted by the TCEQ for municipal and manufacturing wastes or by the Railroad Commission of Texas for oil and gas operations. The permitting process through TCEQ for deep well injection can be costly and take several years. Options for salt water disposal through the oil and gas industry either by injection or oil field flood are likely to be easier to implement, but these options require willing oil/gas participation with appropriate facilities. One implementation issue associated with evaporation ponds or drying beds is available space. For small-scale projects, this may be an option, but large scale projects will generate considerable amounts of brine requiring significant area for effective evaporation.

Mitigation requires would vary depending on impacts. Mitigation is expected to be negligible for the infrastructure improvements. Mitigation requirements associated with the disposal of the brine effluent are unknown.

Table 8.4-4 Caption Comparison of Midway Group Interconnections to Plan Development Criteria

Impact Category	Comment(s)
A. Water Supply	Requires approval of the BRA System Operations permit at TCEQ
1. Quantity	1. Sufficient to meet needs
2. Reliability	2. High reliability
3. Cost	3. Moderate
B. Environmental factors	
1. Environmental Water Needs	1. Possible low to moderate impact, depending on disposal method for brine effluent
2. Habitat	2. Low impact possible where new pipelines are constructed
3. Cultural Resources	3. Possible low impact
4. Bays and Estuaries	4. No substantial impact
5. Threatened and Endangered Species	5. Possible low to moderate impact, depending on disposal method for brine effluent
6. Wetlands	6. Low impact possible where new pipelines are constructed
C. Impact on Other State Water Resources	No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	No apparent negative impacts on agriculture or natural resources
E. Equitable Comparison of Strategies Deemed Feasible	Option is considered to meet demand
F. Requirements for Interbasin Transfers	No interbasin water transfer required
G. Third Party Social and Economic Impacts from Voluntary Redistribution	No anticipated third party impacts