Chapter 5

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

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The regulations that describe the content and process for the development of regional water plans direct that the plan "include a description of the major impacts of recommended water management strategies on key parameters of water quality identified by the regional water planning group . . ." and "impacts on agricultural resources." [30 TAC 357.7(a)(12); 30 TAC 357.7(a)(8)]. In the 2006 East Texas Regional Water Plan, this chapter provided information and recommendations to assist the ETRWPG in identifying the key water quality parameters that may be impacted by implementation of recommended WMSs that were new to the regional water plan in 2006. Chapter 5 for the 2011 Plan reviews the selected water quality parameters, discusses how various types of WMSs could affect water quality, and presents a listing of the WMS developed in the 2011 Plan. Also included is an assessment of the key water quality parameters that could be affected by the implementation of each new WMS. In addition, this chapter provides information relating to the potential impacts of moving water used for rural or agricultural purposes to urban uses.

5.1 Key Water Quality Parameters

The following water quality parameters were selected by the ETRWPG in the 2006 Plan as parameters that could be impacted by WMS recommended for the ETRWPA:

- Total Dissolved Solids (TDS)
- Dissolved Oxygen (DO)
- Nutrients
- Metals
- Turbidity

A discussion of these parameters and the rationale for their selection by the ETRWPG is contained in the 2006 Plan. The ETRWPG has determined that these same parameters will be evaluated for the 2011 Plan.

5.2 Summary of Potential Impacts of Water Management Strategies on Water Quality

The implementation of specific WMS can potentially impact both the physical and chemical characteristics of water resources in the region. An assessment of the characteristics of each WMS that can affect water quality follows. The assessment includes a discussion of how the specific water quality parameters identified above could be affected by various types of WMS. In addition, WMS that have been identified for the first time in the 2011 Plan will be evaluated for their specific potential impacts on water quality.

The following WMS types are employed in the ETRWPA:

- Expanded use of existing surface water resources
- Interbasin water transfers
- New reservoirs
- Expanded use of groundwater resources
- Indirect Reuse
- Expansion of local supplies
- Voluntary redistribution
- Water conservation

Table 5.1 summarizes how the various types of water management strategies could impact water quality.

Table 5.1 Evaluation of Potential Water Management Strategy Impacts on Water Quality

Water Quality Parameter	Water Management Strategy Types							
	Expanded Use of Surface Water	Inter-basin Transfers	New Reservoirs	Expanded Use of Ground-water	Indirect Reuse	Expanded Use of Local Supplies*	Voluntary Re-distribution **	Water Conservation ***
TDS	•	•	•	•	•		•	
Dissolved Oxygen	•	•	•		•			
Nitrogen	•	•	•		•		•	
Phosphorus	•	•	•		•		•	
Metals	•	•	•	•	•		•	
Turbidity		•					•	

*Expanded use of local supplies would not typically be expected to have a significant impact on water quality.
**Voluntary Redistribution could have an impact on the water quality of the receiving water body
***Water conservation would not typically be expected to have a significant impact on water quality

5.2.1 Expanded Use of Existing Surface Water Resources. The expanded use of existing surface water resources will provide much of the increased water supply for the ETRWPA during the planning period. The primary physical impact of this expanded use of surface water is a change in the volume of water remaining in the river basin (i.e., flow in a stream or storage in a lake).

Impacts on key water quality parameters vary depending on factors such as the location of the source and the intended destination of the water transfer. For strategies that involve pumping existing surface water directly to a water treatment plant, no impact on water quality is anticipated. However, when water is pumped from one source to another, the impacts will depend on the existing water quality of the two sources, as well as the quantities to be transferred and any mitigation that may be applied.

5.2.2 Interbasin Water Transfers. ETRWPA interbasin water transfers currently occur in Jefferson, Nacogdoches, Orange, and Rusk Counties. The major water transfers occur in Jefferson and Orange Counties. Major municipal populations and industrial activities are located in both Jefferson and Orange Counties. Water transfers in these counties are designed to compensate for the deficit of available water in specific portions of each county. Some voluntary redistribution or surface water expansion strategies may involve interbasin transfers within the region.

In cases where the water characteristics of the source and destination river basins are significantly different, the interbasin transfer can cause changes in the receiving water body. Changes in TDS, alkalinity, hardness, or turbidity can impact water users, particularly industrial users that have treatment processes to produce high quality waters (for boiler feed, for example) and water treatment plants. Water treatment processes are tailored to the quality of the water being treated. If the quality of the feed water changes, the treatment process may have to be changed as well. Changes in nutrient concentrations or water clarity can affect the extent of growth of algae or aquatic vegetation in a stream. The same concentration of nutrients can produce different levels of algal growth in different water bodies depending on factors such as water clarity, shading, stream configuration, or other chemical constituents in the waters. With respect to water clarity, there are also aesthetic considerations. It is generally not desirable to introduce waters with higher turbidity, or color, into high clarity waters. Because the river basins within the ETRWPA have similar water characteristics, interbasin transfers within the region generally do not have significant water quality impacts.

Some of the recommended and alternative strategies for the Region C water planning area call for increased use of water from reservoirs located in Region I (or proposed to be located in the region). In general, reservoirs in East Texas have higher concentrations of nutrients (i.e., nitrogen and phosphorus) than many of the Region C reservoirs. The ultimate impact of importing water with higher nutrient concentrations to Region C reservoirs is difficult to predict due to the complex kinetic relationships between nutrients and chlorophyll-a. Strategies that involve importing water from East Texas reservoirs to Region C reservoirs may result in increases in nitrogen and

phosphorus, but are not likely to lead to impacts that would impair the designated uses of the Region C water bodies.

In general, the TDS concentrations in East Texas reservoirs are lower than in Region C reservoirs. Therefore, in nearly all cases, transfer of water from the ETRWPA to Region C reservoirs will have a positive impact on TDS concentrations in the receiving water bodies. All of the recommended water management strategies involving exportation of East Texas water to Region C reservoirs are anticipated to have minimal impact on key water quality parameters.

5.2.3 New Reservoirs. One proposed WMS to serve needs in the ETRWPA is the development of Lake Columbia on Mud Creek. Lake Fastrill is a proposed WMS for needs in Region C. The most significant potential impact of new reservoir construction is the inundation of bottomlands and a decrease in instream flows below the reservoir. If this occurs, the potential impacts include those described in the previous section when instream flow is reduced due to increased stream usage, i.e., potential impacts on TDS, nutrients, DO, and, in some cases, metals. Other impacts from new reservoirs on water quality could be associated with changes to the flow regime downstream of the dam that would result. Such changes in flow would result in significant changes to sediment loads, scouring in the stream, and other geomorphic changes.

Significant water quality impacts resulting from new reservoir construction could occur when the dam release structures are designed to release water from the hypolimnion (e.g., bottom release of water through the dam). During the summer season, water quality concerns with respect to waters in the hypolimnion include decreased oxygen levels, low temperature, and high nutrient concentrations.

The development of a reservoir requires extensive environmental impact analysis prior to its approval that examines all such potential water quality issues. Any water quality issue anticipated by construction of the reservoir would likely be investigated and mitigation plans developed, if deemed necessary. Therefore, adverse water quality

impacts anticipated by construction of new reservoirs should be considered low, due to mitigation requirements.

5.2.4 Expanded Use of Groundwater Resources. Proposed ETRWPA WMS include increased uses of groundwater from the Carrizo-Wilcox aquifer, Gulf Coast aquifer, Yegua-Jackson aquifer, Queen City aquifer, and Sparta aquifer. The increased withdrawal of groundwater can affect both the quantity and quality of water resources in the region. There is significant potential that increased use of groundwater will increase TDS concentrations in area streams. Groundwaters frequently contain higher concentrations of TDS or hardness than are considered desirable for domestic uses. Some homeowners may install treatment systems to reduce TDS or hardness. Operation of these systems may introduce high concentrations of TDS to municipal wastewater systems or area streams. However, because these discharges are expected to be small, the overall impacts should be negligible. Increased withdrawal of groundwater resources can also affect the quality of the water in the aquifers by increasing the potential for the intrusion of saltwater and/or brackish water into the aquifers, especially in coastal regions.

5.2.5 Indirect Reuse. This strategy involves the discharge of treated wastewater effluent into a body of water used for water supply. The purpose of the discharge may simply be a result of the need to dispose of the treated wastewater or may be for the specific purpose of augmenting the water supply. Treated wastewater can contain nutrient and TDS concentrations that are high in comparison to the receiving water. However, for most of the recommended strategies that include indirect reuse, advanced wastewater treatment, constructed wetlands, or blending, etc., would be required to mitigate potential water quality impacts associated with nutrients and TDS. For the purposes of this evaluation, it is assumed that some form of mitigation for potential water quality impacts associated with the key parameters will be implemented, if necessary. For this reason, impacts on water quality resulting from indirect reuse are expected to be minimal.

5.2.6 Expansion of Local Supplies (Livestock Ponds). The development of additional livestock ponds involves the capture of localized water for individual use,

generally. In East Texas, where rainfall is generally abundant, this diversion of small volumes of localized runoff would not result in a significant reduction in overall flow in streams. It is not expected to cause significant impacts to water quality.

5.2.7 Voluntary Redistribution. The voluntary redistribution of water from one water supplier to another does not cause impacts on water quality unless the redistribution includes expanded use of surface water or groundwater, or involves a transfer of water from one basin to another. Potential water quality impacts of the expansion of existing water supplies, or interbasin transfers, have been previously described.

5.2.8 Water Conservation. Water conservation is the development of water resources and practices to reduce the consumption or loss of water, increase the recycling and reuse of water, and improve the efficiency in the use of water. Water Conservation Plans are designed to implement practices to conserve water and quantitatively project water savings. The water conservation measures recommended in the ETRWPA are not expected to affect water quality adversely. The results should generally be beneficial because the demand on surface and groundwater resources will be decreased. Quantifying such positive impacts could be very difficult. Chapter 6 contains additional discussion of water conservation in the ETRWPA.

5.3 Impacts of Moving Rural and Agricultural Water to Urban Uses

As the population of Texas increases, municipal and industrial water demands will rise accordingly, even with the implementation of conservation measures. The largest proportion of additional municipal water supply that will be utilized in The ETRWPA over the planning period will be from expanded use of existing surface water supplies and, to some extent, development of new surface water supplies such as Lake Columbia. Surface water demand will increase for municipal and industrial water users as addressed in Chapter 4. However, as currently planned, the expanded use of surface water is not expected to involve significant transfers of agricultural supplies to municipal

or industrial supplies. The proposed increases in municipal water surface water supplies will rely on existing water rights or new water rights from currently unpermitted supplies.