Section 5
Impacts of Water Management Strategies on Key Parameters of Water Quality [31 TAC §357.7(a)(12)] and Impacts of Moving Water from Rural and Agricultural Areas [31 TAC §357.7(a)(8)(G)]

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

In accordance with Regional Water Planning Guidelines 357.7(a)(12), at its November 20, 2003, meeting, the LERWPG identified the following list of key parameters of water quality as important to the use of the water resource:

- Chlorides;
- Sulfates;
- Nitrates;
- Flouride;
- Arsenic;
- Total Dissolved Solids (TDS);
- Dissolved Oxygen (DO);
- pH Range;
- Indicator Bacteria; and
- Temperature.

The uses of the water resources in the Llano Estacado Region were identified as follows:

- Recreation;
- Aquatic Life;
- Domestic Water Supply;
- Agriculture – Crop Irrigation ;
- Agriculture – Livestock Water; and
- Agribusiness.

The water management strategies included in the Regional Water Plan are:

- Municipal Water Conservation;
- Water Supply from Nearby Groundwater Sources for Cities Projected to Need Additional Municipal Supply;
- Water Supply from Lake Alan Henry and Groundwater Sources;
- Precipitation Enhancement;
- Brush Control;
- Desalt Brackish Groundwater;
- Post Reservoir-Raw Water at the Reservoir;
- Research and Development of Drought Tolerant Crops and New Technology;
- Reuse of Municipal Effluent for Potable Water Supply; and
- Stormwater Capture, Treatment, and Use.

Municipal Water Conservation: The municipal water conservation water management strategy is projected to have the potential to meet approximately 10,583 acft/yr of municipal water demand in 2020, 10,264 acft/yr in 2040, and 10,424 acft/yr in 2060 (Table 4.4-7). This water management strategy would not affect the key water quality parameters listed above.

Water Supply from Nearby Groundwater Sources for Cities Projected to Need Additional Municipal Supply: This water management strategy involves the addition of water wells and/or well fields by 24 municipalities of the region. In most cases, this strategy is the expansion of municipal supplies from existing sources available to each respective city (Section 4.4.2). However, in some cases it will be necessary for the individual municipality to obtain locations for additional well fields in nearby locations. As was determined in the analyses, in all but three cases adequate saturated formation exists within a 2- to 5-mile radius of each city, respectively, to locate new well fields. For the other three, the distances are between 6 and 14 miles. In effect, this water management strategy is a continuation of existing practices which have shown no indication of affecting the water quality parameters listed above. In addition, the quality of the water available is suitable for the intended municipal use.

Water Supply from Lake Alan Henry and Groundwater Sources: The use of Lake Alan Henry water may have the potential to result in slight increases in chlorides, sulfates, and TDS in the downstream reaches of the stream on which it is located. The expansion of groundwater uses from wells in Lubbock's Bailey County well field, and groundwater sources being obtained by CRMWA from locations in Region A would not be expected to affect the water quality parameters identified above.

Precipitation Enhancement: This strategy is an attempt to increase precipitation within parts of the Llano Estacado Region, and as such is not expected to affect the water quality parameters identified above.

Brush Control: This strategy is an attempt to reduce the undesirable use of both ground and surface water by a range of woody species, and thereby increase the quantities of water available for all other uses. This strategy is not expected to affect the water quality parameters identified above.

Desalt Brackish Groundwater: This strategy relies upon the use of source water for municipal uses which is lower in quality than other source waters now being used and/or included in other water management strategies. The return flows of municipal effluent from the use of this water management strategy may be higher in chlorides, sulfates, and TDS, than return

flows from other source waters now being used and/or included in other water management strategies, depending upon the level of demineralization of the brackish groundwater.

Post Reservoir–Raw Water at the Reservoir: This strategy would result in a new source of surface water, which is not expected to affect the water quality parameters listed above.

Research and Development of Drought-Tolerant Crops and New Technology: This strategy involves the invention of new water using or water using related technology and as such cannot be evaluated as to potential effects upon the water quality parameters listed above until the specified techniques are known.

Reuse of Municipal Effluent for Potable Water Supply: This strategy proposes to reuse municipal effluent whose quality is lower than the original source water. Therefore, the water will have to be demineralized before it can be used for potable purposes, and depending upon the degree of demineralization, would be expected to have higher concentrations of water quality constituents than presently used sources. The resulting return flows would also be higher in many of the water quality parameters listed above, including chlorides, sulfates, nitrates, and TDS.

Stormwater Capture, Treatment, and Use: As is the case with municipal effluent, this strategy proposes to capture, treat and make available for use stormwater for municipal uses within the region. The quality of stormwater depends upon the drainage areas from which it is captured. In the case of lakes and reservoirs such as Alan Henry and Post, the quality is usually high and is the type of water for which there is extensive, successful experience with treatment and use. In the case of stormwater runoff from urban areas, the quality may be poor due to transport of urban pollutants such as oil, grease, pesticides, insecticides, and bacteria. Treatment of such water will be required, and the quality of the resulting water and its return flows depends directly upon the degree of treatment given.

5.2 Impacts of Moving Water from Rural and Agricultural Areas

Total water use in the Llano Estacado Region in year 2000 was reported at 4.530 million acft, with projected demands of 3.704 million acft in 2060. Of the total projected demands, irrigated agriculture and livestock uses are more than 95 percent; with municipal use in the 2 to 2.5 percent range over the planning period. Supplies available are projected to decline from 3.20 million acft in 2010 to 1.46 million acft in 2060. Recommended water management strategies for municipal uses would result in the development of approximately 8,300 acft/yr

from local groundwater sources or about 0.26 percent of total supply available on an annual basis in 2010, and 0.56 percent of total supply available in 2060. Of this total, about 50 percent (4,150 acft/yr) would be from existing well fields that were obtained many years ago by municipalities for municipal uses, and about 50 percent (4,150 acft/yr) would be transferred from rural and agricultural areas to municipal areas through the acquisition of additional sites for well fields in approximately 12 to 15 widely dispersed locations near to the municipalities that acquire them. The impacts of these transfers are not considered to be significant to the local areas, however, to the extent that such transfers reduce water supplies available to irrigated agriculture and/or livestock or dairies, the economic impacts would result in lower levels of farm production and farm incomes, and would reduce business to agricultural input suppliers and agricultural marketing establishments; i.e.; the adverse results would extend throughout the local economy including third party agricultural service, finance, and marketing sectors of the local region.

5.3 Impacts of Limited Water Quantity Upon Irrigated Agriculture[1]

The water supply projections of Section 3.0 show that the total quantity of water available for use in the region from the Ogallala aquifer was 4,501,390 acft/yr in year 2000, declining to 3,054,897 (68% of quantity in 2000) acft/yr in year 2010, 1,960,641 (43% of level in 2000) acft/yr in year 2030, and to 1,328,057 (30% of quantity in 2000) acft/yr in 2060 (Table 5-1). The analyses also show that the Ogallala aquifer is the major source of water supply available to the region, supplying 96 percent of the total in year 2000, 95 percent in 2010, 93 percent in 2030, and 89 percent in 2060.

The water demand and supply analyses in Section 4.0 for the water user groups of the region show that the quantity of water available from the Ogallala aquifer for irrigated agriculture was 4,411,987 (98% of the total) acft/yr in year 2000, 2,951,555 acft/yr (97% of the total) in year 2010, 1,851,051 acft/yr (94% of the total) in year 2030, and 1,219,946 acft/yr (92% of the total) in year 2060. This projection of the declining trend of supply available to irrigated agriculture from year 2000 of 33 percent by year 2010, 58 percent by year 2030, and 70 percent by year 2060 indicates that the irrigated agriculture water using sector of the region faces a

[1] This Subsection has been added in response to TWDB Comments on Initially Prepared 2011 Region O Regional Water Plan, "Pages 1-66 through 1-69, Section 1.8; pages 5-1 through 5-3, Section 5.1: Please clarify in the plan whether any existing threats of limited water quantity with respect to irrigated agriculture were considered (page 1-66) and whether such a threat would be addressed or affected by the recommended water management strategies (page 5-1). *[Title 31 Texas Administrative Code (TAC) §357.7 (a)(1)(L) and (a)(8)(C)]*

steady decline in supply of irrigation water. The comparisons of projected irrigation water demand and supply showed needs (shortages) of irrigation water in 2010 of 1,253,776 acft/yr (30% of projected demand) in 2010, 2,053,847 acft/yr (53% of projected demand) in 2030, and 2,290,512 acft/yr (66% of projected demand) in 2060. The socioeconomic impact analysis of not meeting irrigation water needs, shows lost income and taxes in 2010 of $370.55 million, $943.44 million annually in 2030, and $1.102 billion annually in 2060.

Table 5-1
Projected Irrigation Water Demands and Supplies
Llano Estacado Region

Region	Projections						
	2000	2010	2020	2030	2040	2050	2060
	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Total Ogallala Supply	4,501,390	3,054,897	2,436,556	1,960,641	1,569,152	1,405,760	1,328,057
Irrigation Supply from Ogallala	4,411,987	2,951,555	2,319,386	1,851,051	1,465,514	1,303,676	1,219,946
Irrigation Water Demand	4,347,877	4,186,018	4,024,942	3,882,780	3,740,678	3,604,568	3,474,163
Supply As Percent of Demand	101.47%	70.51%	57.63%	47.67%	39.18%	36.17%	35.11%
Irrigation Water Need (Shortage)	NA	1,253,776	1,722,691	2,053,847	2,301,750	2,332,340	2,290,512
Irrigation Water Conservation	NA	479,465	431,517	388,365	349,529	314,576	283,118
Irrigation Water Conservation as Percent of Need	NA	38.24%	25.05%	18.91%	15.19%	13.49%	12.36%
Supply with Water Conservation	Na	3,431,020	2,750,903	2,239,416	1,815,043	1,618,252	1,503,064
Supply with Water Conservation as Percent of Demand	NA	81.96%	68.35%	57.68%	48.52%	44.89%	43.26%
NA means not applicable.							<><><>

During the development of the 2011 Llano Estacado Regional Water Plan, the only feasible irrigation water management strategy that could be identified was irrigation water conservation, which is included in the plan. The irrigation water conservation water

management strategy has the potential to offset 479,466 acft/yr, or 38.2 percent of the projected need in year 2010, 388,366 acft/yr, or 18.9 percent of the projected need in 2030, and 283,118 acft/yr, or 12.4 percent of the projected need in 2060 (Table 5-1).

The results of declining water supplies available to irrigated agriculture will be reduced numbers of acres irrigated, reduced levels of irrigation water applied per acre, or a combination of reduced irrigated acreages and application rates, both of which will adversely affect the local, regional, state, and national economies.

The Region O Water Planning Group recognizes that the quantity of water available from the High Plains Ogallala aquifer is declining, however with the implementation of water conservation strategies, the longevity of the Ogallala can be appreciably extended. Ground water is an exceedingly valuable asset to all of the Region O landowners and water rights holders, whether agricultural, municipal or industrial, and justifies implementation of all currently available water conservation strategies and technologies, including refinements thereto, and all strategies which may be developed in the future.