CHAPTER 5: RECLAIMED WATER QUALITY CONSIDERATIONS

5.1 Summary of Texas Reclaimed Water Regulations

There are currently no regulations specific to indirect potable reuse or recycled water for the state of Texas, but there are some parameters for direct nonpotable applications. In the state of Texas, the TCEQ regulates the use of reclaimed water for nonpotable uses only after the notification by a water producer of the intent to provide reclaimed water for specified purposes. Regulations are found in Title 30, Chapter 210 of the Texas Administrative Code, which defines two types of reuse water based on its level of contact with the public. Quality requirements are based on the intended use and the potential for human contact with the water. For those uses in which there is a high potential for public contact (e.g. parks or school ground irrigation), Type I requirements apply. Reclaimed uses for which there is controlled access to the usage site are classified as Type II. More specific uses and the requisite water quality parameters are defined below.

Type I Potential Uses

- Irrigation of residential lawns, public parks, golf courses, and athletic fields
- Fire protection
- Irrigation of food crops and pastures for milking animals
- Maintenance of natural water bodies where recreational activities are anticipated
- Toilet or urinal flush water

Type II Potential Uses

- Irrigation of sod farms, silviculture, limited access and ROWs
- Irrigation of animal feed crops and food crops without contact with edible part or with pasteurization
- Maintenance of impoundments or water bodies where direct human contact is unlikely
- Soil compaction or dust control
- Irrigation or other nonpotable uses at a WWTP
- Cooling tower make-up water

Table 5-1: Water Quality Parameters for Different Water Reuse Applications

	Type I	***Type II***
Quality Standards (30 day average)	• $BOD_5/CBOD_5$ = 5mg/L • Turbidity = 3 NTU • Fecal coliform < 20 or < 75 CFU/100 mL (single grab)	• BOD_5 = 20 mg/L • $CBOD_5$ = 15 mg/L • Fecal coliform < 200 or < 800 CFU/100 mL (single grab) • For a pond system: BOD_5 = 30 mg/L, Fecal Coliform < 200 or < 800 CFU/100 mL (single grab)
Sampling/Analysis Frequency	Twice per week	Once per week

5.2 Effluent Water Quality

5.2.1 Village Creek WWTP

Village Creek currently employs conventional liquids treatment processes consisting of screening, primary clarification, biological treatment, final clarification, filtration, and disinfection. The plant's current treatment processes easily meet Type I requirements consistently. The turbidity is an order of magnitude lower than required, and the CBOD stays well below the 5 mg/L limit. However, as the plant flows increase toward the design capacity, some additional treatment capacity (such as additional filters) may be required for a sustained Type I effluent quality. Figure 5-1 shows Village Creek effluent quality data for the relevant reuse parameters for 2006.

5.2.2 Denton Creek RWS

The Denton Creek Regional Wastewater System (DCRWS) uses mostly conventional treatment for the liquids train, with the exception of splitting clarified influent between activated sludge basins (ABs) and sequencing batch reactors (SBRs). Flow from both the ABs and the SBRs is blended, filtered and disinfected before discharge. Disinfection is performed using ultraviolet radiation.

Because DCRWS is not currently supplying reuse water for any applications, data for turbidity is not yet available. However, water quality data for other parameters, including CBOD and fecal coliform, are plotted in Figures 5-2 and 5-3.

The DCRWS data indicate that CBOD concentrations are consistently below the Type I limit. On several occasions the fecal coliform single grab data were above the Type I limit. However, it is anticipated that these excursions can be corrected with tighter control of UV disinfection operations and/or chlorination of the reclaimed water.

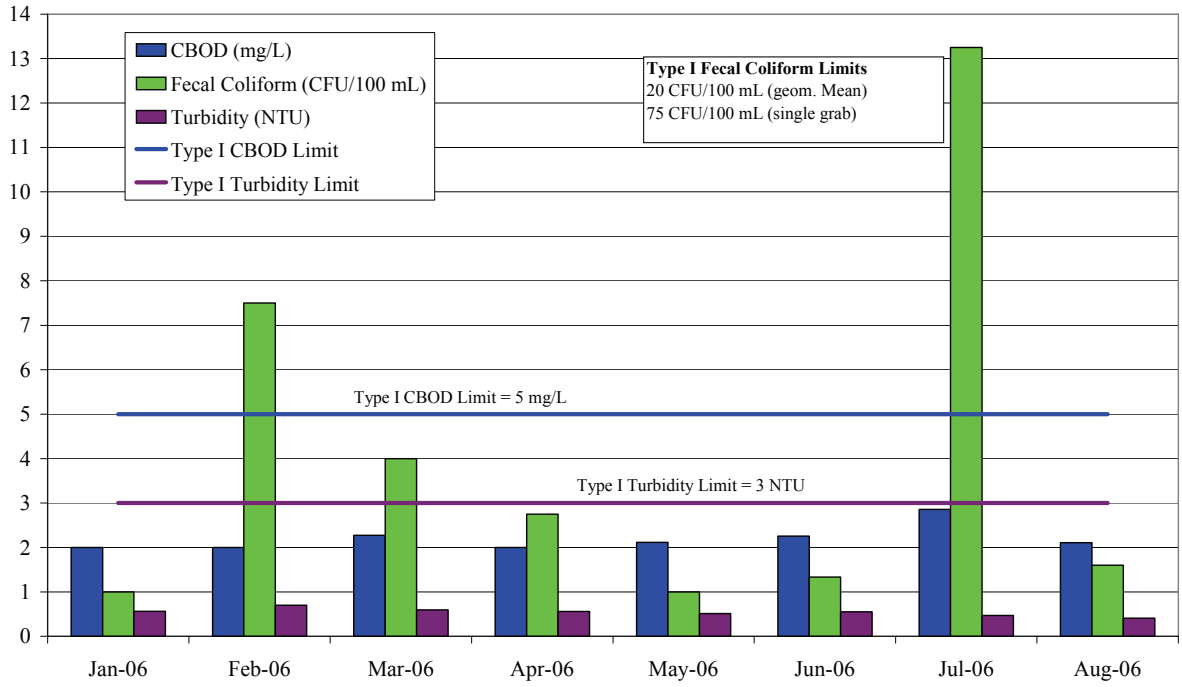

Figure 5-1: Village Creek Water Quality Data for Reuse Constituents

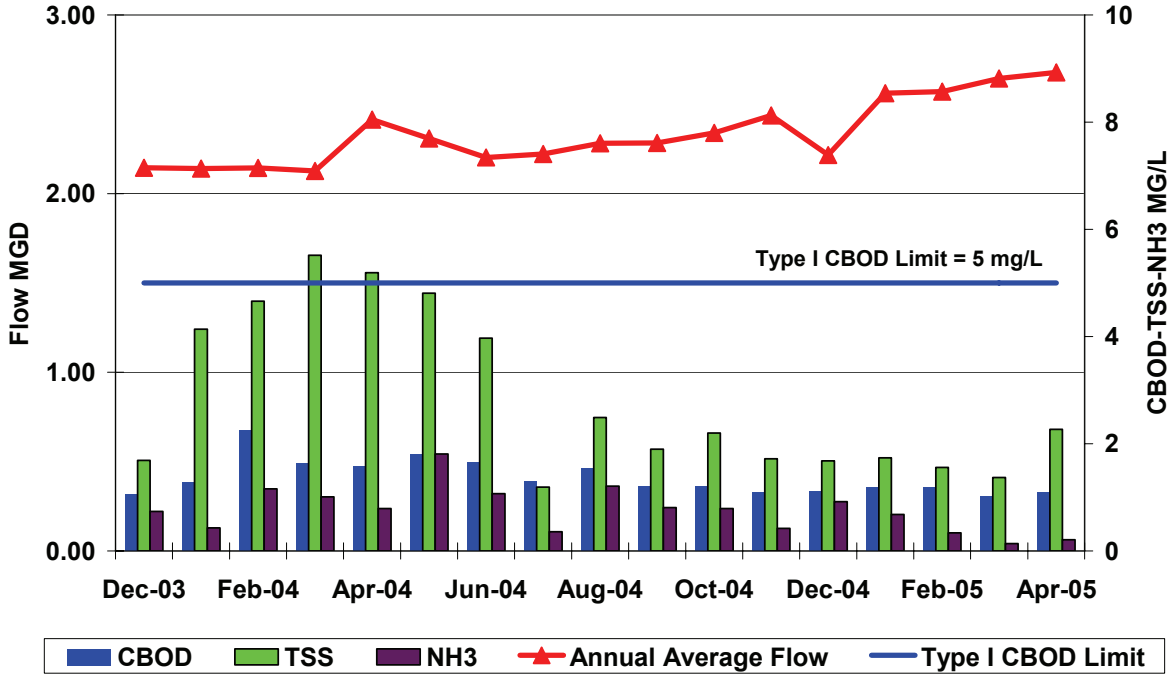

Figure 5-2: CBOD, NH3 and TSS Data for DCRWS

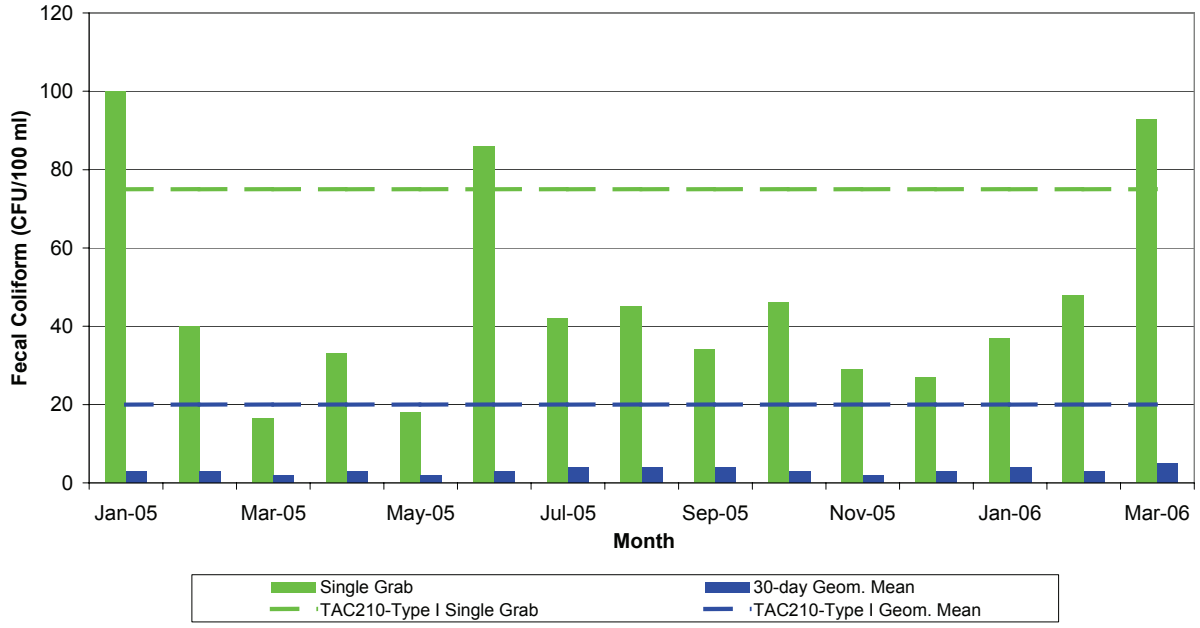

Figure 5-3: Fecal Coliform Data for DCRWS

5.3 Additional Quality Parameters for Specific Uses of Reclaimed Water

Unfortunately, data for the DCRWS effluent with regard to the following discussion were not available.

5.3.1 Irrigation

Many reuse applications involve using treated effluent to irrigate parks, golf courses and crops. In these instances, it is beneficial and desirable that the effluent contains a level of nutritive constituents, such as nitrogen and phosphorous, that contribute positively to the health of lawns and green spaces. Figure 5-4 shows the levels of some of these constituents measured in Village Creek effluent.

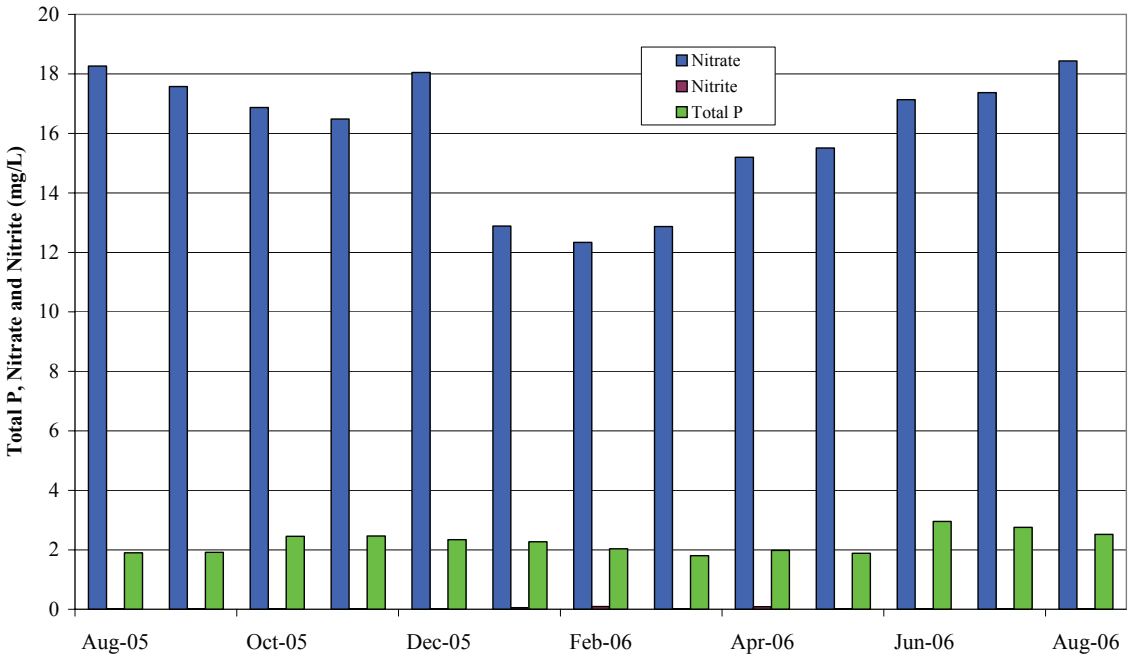

Figure 5-4: Nutritive Constituents in Village Creek Treated Effluent

Total phosphorous levels, nitrite and nitrate concentrations were included on these figures in order to show the potential nutritive qualities the effluent might have for irrigation; however, there are additional parameters such as total dissolved solids (TDS) that, in high concentrations, have adverse effects on vegetation. Dissolved solids can inhibit the uptake of water in plants, or contribute to the inadvertent uptake of high concentrations of salts, which damage plant tissues. A commonly used surrogate for the level of salts that comprise the overall TDS is chloride, which can begin to adversely affect the health of plants at levels approximating the 200-300 mg/L range. Village Creek data, not shown here, indicate that on average the chloride concentrations reach only 100 mg/L. Because of the concerns surrounding solids and salts, restrictions can be placed on golf course irrigation water when TDS concentrations reach greater than 450 mg/L. At concentrations greater than 2,000 mg/L, the use of reclaimed water may be discontinued altogether until the levels of solids are reduced.

5.3.2 Industrial Cooling Water

In the event that reclaimed water is to be used in industrial cooling towers, it may be necessary to provide additional treatment beyond what the treatment plant affords. Dissolved solids in the water can precipitate out and result in clogging or corrosion of pipes. Often, membrane filtration is a prerequisite for making reuse water attractive to industry for these purposes. One of the more critical parameters for industrial reuse applications is total hardness, measured as the sum of calcium and magnesium levels, because it often dictates the extent to which deposits are formed in cooling tower piping. The average total hardness of the Village Creek effluent in 2005 was approximately 165 mg/L; for 2006 it was slightly higher at 176 mg/L. It is often the case that industries have on-site softening systems which could treat the effluent to acceptable levels. Other cations may be present,

however these should not be in any significant quantity as the alkalinity of the water was comparable to the hardness levels: 133 and 132 mg/L for 2005 and 2006 respectively. For other metals, such as copper and zinc, acceptable levels should be determined by individual industrial customers, but these elements were not detected in levels that are particularly hazardous to aquatic or human life. Again, it is likely that specific testing will have to be conducted depending on the reclaimed water customer and the effluent use. Figure 5-5 shows the total alkalinity and hardness for VCWWTP effluent.

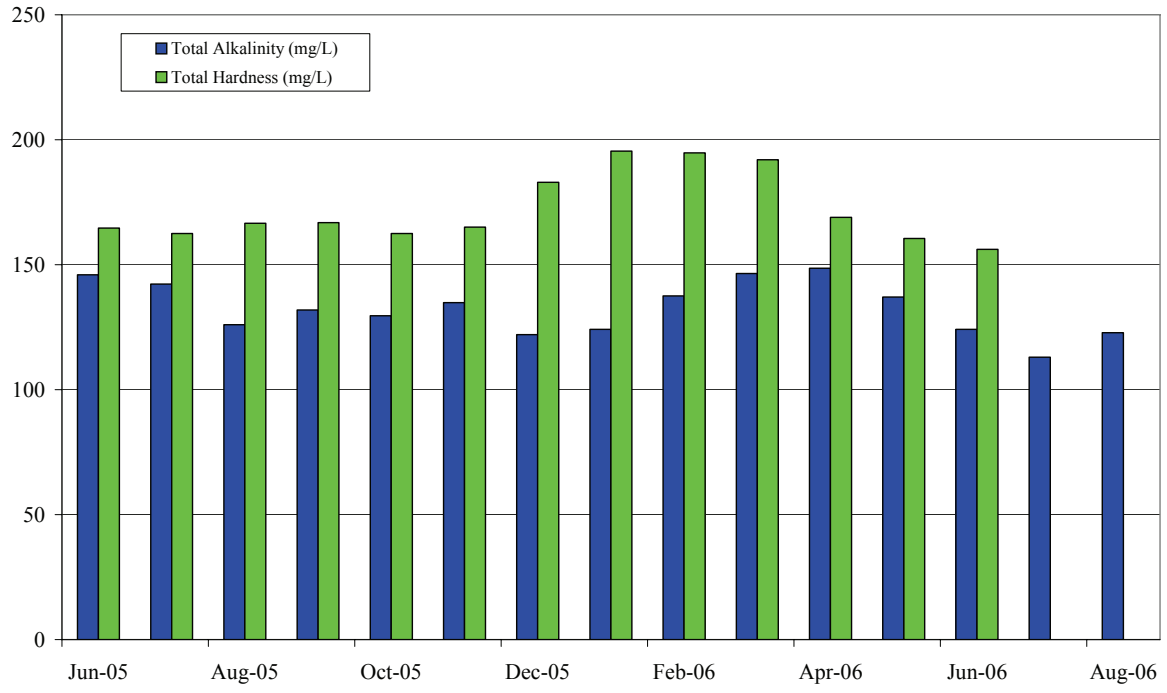

Figure 5-5: Total Alkalinity and Total Hardness of Village Creek WWTP Treated Effluent

5.3.3 Make-Up Water (Augmentation)

Another application of Type I reclaimed water is the augmentation of recreational impoundments and aesthetic water features such as park fountains. Because of the potentially high level of human exposure in recreational waters, additional testing for bacteria or viruses (e.g. E. coli) or more frequent testing may be warranted. In addition, reduction of nutrient levels may be necessary to minimize algae growth in ponds or lakes.

5.3.4 Other Reuse Applications

There are many possible uses for reclaimed water. Car washes, wetland augmentation, and athletic field irrigation have also been identified as possible users of reclaimed water. Some industrial uses require a highly treated product which would exceed Type I standards; other uses may have to be evaluated individually in order to ascertain acceptable levels for use. Nevertheless, Type I standards provide a public health and environmental standard that meets most reuse needs.

5.4 Potential Future Water Quality Requirements for City of Fort Worth WWTP Effluent

It is difficult to predict what new federal or state requirements may be applied to discharge permits in the future. As plants move into more recycled water projects, total dissolved solids (TDS) levels may become an issue, and there are some TPDES permits with TDS limits in them at this time. The EPA has also required all states to incorporate some form of nutrient standards into the surface water quality standards. Thus, in the future, discharges permits will likely include a phosphorous limit, and possibly a nitrogen limit; however this has more of an impact on conventional discharge than on most reuse applications. As these regulations are implemented, there are several types of treatment technologies, such as denitrifying filters, that are readily available for use at either of the treatment plants discussed. It should be noted, though, that direct reuse programs reduce the nutrient loading to the receiving streams. Therefore, even with the possible tightening of effluent permit limits, reuse could help reduce the impact more stringent permitting requirements would have on the WWTPs with regard to the requisite treatment process alterations to meet future limits.

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