Section 3
Regulatory Review

3.1 National Trends

Nationally, higher water quality is being required in wastewater discharge permits to reduce impacts on impaired waters. Consequently, lower nutrient limits in receiving waters and wastewater plant discharges are being established. Where allowed under state regulated total maximum daily limit (TMDL) plans, increased use of reclaimed water can provide at least a partial solution to reducing the total mass loading of nutrients by application of the nutrients in reclaimed water to both agricultural and landscape demands.

In addition to traditional irrigation uses, use of reclaimed water for cooling in power and building climate control systems is an increasing trend that recognizes the energy-water nexus. Power generating stations, central chiller plants, and large cooling tower systems for data centers are increasingly using high quality reclaimed water, reducing the demand on existing potable water systems.

One national discussion point that started as a suggestion by Dr. Dan Okun, former Professor Emeritus at UNC Chapel Hill, is to convert potable water distribution systems to reclaimed water distribution and install new, high quality potable water systems piped to potable uses only in businesses and residences. As reclaimed water supplies increase and old potable water distribution systems can no longer maintain the desired potable water quality, this suggestion may receive more attention.

The most recent version of the U.S. Environmental Protection Agency (EPA) “Guidelines for Water Reuse” document was published in September 2012. The guidelines cover technical, regulatory, and engineering aspects of water reuse and highlight recent experience from a range of water reuse applications being implemented around the world, including a case study featuring the Town of Cary reclaimed water system (see Appendix G). In addition to updating the technical and regulatory information provided in the 2004 guidelines, the 2012 guidelines also discuss the role of reuse in the integrated water resource planning process.

With national population-based water demand increases (240 percent increase between 1900 and 2000 (NRC, 2012)) combined with stress on locally available water supplies in many areas, there is an increased interest in total water management programs that consider intentional indirect potable reuse (IPR) and direct reuse of highly treated reclaimed water along with other non-potable reuse alternatives. On January 10, 2012 the National Research Council, National Academy of Science (NAS) issued a Report titled "Water Reuse: Potential for Expanding the Nation's Water Supply through Reuse of Municipal Wastewater". Among the numerous topics discussed, the NAS report identifies that many of the nation’s water supplies have been operating on tight supply margins and that many are now recognizing that there is a “de facto” or unplanned reuse of wastewater effluent discharged upgradient by another community. Through numerous examples and comparative risk discussions, NAS finds that

> "... with recent advances in technology and design, treating municipal wastewater and reusing it for drinking water, irrigation, industry, and other applications could significantly increase the nation's total available water resources, particularly in coastal areas facing water

shortages. Moreover, new analyses suggest that the possible health risks of exposure to chemical contaminants and disease-causing microbes from wastewater reuse do not exceed, and in some cases may be significantly lower than, the risks of existing water supplies."

This is not to suggest that all communities immediately implement direct potable reuse projects, but that the technology, monitoring and controls are available to apply technology to reuse water sources under our control in a more cost-effective management approach. However, concerns exist about the presence of endocrine disruptors and other hormones and pharmaceuticals in wastewater and the unknown long-term effects of consuming these contaminants through drinking water. While this trend is gaining more attention nationally, the Town of Cary has ample opportunity for non-potable reuse. At this time, it is not recommended that the Town consider future indirect or direct potable reuse.

3.2 North Carolina Trends

According to census reports for 2010 through 2012, North Carolina has experienced the fifth largest population increase in the country, and the Triangle area continues to grow because of the benefits and opportunities of the area. This increases the need for planning and timely response to meet growing utility demands. Recognition of this growth allows planners to consider a total water management approach to their water, wastewater and reclaimed water utilities.

Effective June 18, 2011, North Carolina adopted changes to the regulations for reclaimed water (North Carolina Administrative Code (NCAC) Title 15A, Subchapter 2U). The new regulations treat reclaimed water as a resource as opposed to waste and allow for additional beneficial uses of reclaimed water including wetlands augmentation and irrigation of food crops intended for direct human consumption. The rules establish two tiers of water quality/treatment standards, as given in **Table 3-1**.

Table 3-1. Type 1 and Type 2 Reclaimed Water Standards

Parameter	Type 1		Type 2	
	Daily Maximum	Maximum Monthly Average	Daily Maximum	Maximum Monthly Average
Turbidity (ntu)	10	--	5	--
BOD_5 (mg/L)	15	10	10	5
TSS (mg/L)	10	5	10	5
NH_3 (mg/L)	6	4	2	1
E. Coli/Fecal Coliform (#/100 mL)	25	14	25	3
Coliphage (#/100 mL)	--	--	25	5
Clostridium perfringens (#/100 mL)	--	--	25	5

Type 1 reclaimed water maintains the same water quality standards as in the previous North Carolina reclaimed water regulations. Type 2 reclaimed water treatment facilities are required to provide dual disinfection systems containing UV disinfection or equivalent and chlorination or equivalent to provide pathogen control and must be capable of the following pathogen reduction:

- log 6 or greater reduction of E. coli;
- log 5 or greater reduction of Coliphage; and

- log 4 or greater reduction of Clostridium perfringens.

Under the existing permits, the Town is required to meet the Type 1 reclaimed water requirements. However, the Town's effluent water quality also meets the more stringent Type 2 reclaimed water requirements.

Reclaimed water systems are classified in North Carolina as either conjunctive or non-conjunctive systems. A conjunctive reclaimed water system refers to a system where beneficial use of reclaimed water is an option and reuse is not necessary to meet the wastewater disposal needs of the facility. In this case, other wastewater utilization or disposal methods (i.e., NPDES permit) are available to the facility at all times. A non-conjunctive reclaimed water system evolved from land disposal system permits and refers to a system where reclaimed water utilization is required (or dedicated) to meet the wastewater disposal needs of the facility and no other disposal or utilization options are available. NCDENR records indicate that of the 117 active reclaimed water permits in North Carolina, 48 percent are for conjunctive use systems and 64 percent of those are from 36 municipalities. Changes in the 15A NCAC 02U Regulations now allow more flexibility for utilities to expand use beyond dedicated land disposal.

Climate change, recurring drought cycles, and changes in precipitation patterns are causing planners to reassess previous water resources plans. Even if the annual rainfall remains relatively constant, higher intensity rainfall can result in more runoff that is not as beneficial as multiple, less intense events. Shifts in time of year for rainfall events can significantly impact soil moisture during critical planting and harvesting periods. This can lead to an increase in supplemental irrigation needs for predictable crop yields. This same change in precipitation pattern impacts all green space, city parks, athletic fields and residential lawns and landscape.

Seasonal demand changes can impact water quality within the distribution system due to an increase in the length of time reclaimed water resides in the system. This is often referred to as water age and is a water quality concern typically monitored by potable water system operators. One effective method to minimize water quality deterioration during low demand periods is to reduce the operations level in reclaimed water distribution storage tanks, which directly reduces the water age. The San Antonio (TX) Water System (SAWS) uses an extension of this approach to maintain water movement in the distribution system while reducing water age. Reclaimed water operations levels in the storage tanks in the seven operation zones are reduced to nominally one half tank depth and reclaimed water supplied from one of the reclamation plants to fill the tanks to this operating level. The systems tanks then provide the pressure head and feed back to meet zone demands and supply reclaimed water for the lower pressure zones. When tanks in the upper pressure zone reach their low level setting, fresh reclaimed water is pumped into the system. This process is reported in a collaborative research report conducted by AWWA Research Foundation and WateReuse Research Foundation, *Characterizing Microbial Water Quality in Reclaimed Water Systems*, 2005. SAWS improves reclaimed water quality as it extends through the distribution system by re-chlorinating the reclaimed water at each storage tank to maintain pre-set chlorine residual within each storage tank. Discharge points to the San Antonio River and Salado Creek support continuous flow through the distribution system, helping to maintain water quality. The discharged reclaimed water benefits the river and creek, augmenting stream flow and supporting the San Antonio tourist economy with flowing water through the downtown River Walk area.

Seasonal demand variations can be minimized by increasing the percentage of industrial users compared to irrigation customers as there is less variation annually in water demands from industrial

customers. One allowable new use is for sewer line flushing. If this activity can be scheduled during the winter months, reclaimed water can beneficially be used to flush sewer mains while offsetting volumes of reclaimed water now discharged through blow-off valves.

The recent changes in the 15A NCAC 02U regulations increase the potential to use reclaimed water in agricultural applications, especially with Type 2 reclaimed water. This higher quality reclaimed water has few agricultural restrictions (one being a 24-hour waiting period following application of reclaimed water prior to harvest). These new rules allow utilities to now consider wholesale supply of reclaimed water to agricultural interests, assuming there is an agreement of the value of this water between both parties.

These changes to allowable agricultural uses provide some seasonal potential opportunities. The Town could consider reduced reclaimed water rates during winter months for agricultural uses to fill private storage ponds for crop irrigation. This allows agricultural users to "invest" in onsite storage and have water in the spring when they need it during growing season. Onsite storage increases the agricultural users water supply reliability and reduces withdraws from current water sources that could be used for domestic purposes. The Town could also consider reduced residential rates for reclaimed water during the winter season. This may keep the reclaimed water turning over and increase soil moisture in advance of spring turf/landscape growth.

Although large power generating needs for reclaimed water currently do not exist, cooling water and industrial process water are attractive to industries and can be supportive of economic development for a community. New residential developments in communities facing water shortages are often able to develop and provide a benefit to residents if reclaimed water is included in a dual water system, allowing homeowners to establish landscape without water restrictions.

In North Carolina today, nutrient reduction requirements and TMDLs are resulting in new or re-issued discharge permits that will require installation of advanced wastewater treatment to meet the limit of technology nutrient removal. These requirements are much like events in 1972 that led to creation of the reclaimed water system for St. Petersburg, Florida. In 1972 the Florida legislature passed the Wilson-Grizzle Act requiring all utilities to cease discharge into Tampa Bay unless they installed advanced wastewater treatment equipment to meet nutrient reduction requirements. Today, St. Petersburg is known as the largest residential reclaimed service provider in the United States with over 10,250 residential customers in addition to 62 schools, 96 city parks, 343 commercial sites, and 6 golf courses. The system also serves 13 cooling tower locations and supplies the community fire hydrants. Demand for the reclaimed water actually exceeds the utility production capability and reclaimed water is purchased from adjacent communities during peak use months.

Going green (or in some cases gray) is sometimes driven by new development decisions to create a Leadership in Energy and Environmental Design (LEED) certified development or building. In the certification process, up to 10 points can be obtained through use of reclaimed water or on-site recycle of alternate waters. The 15A NCAC 02U rules allow reclaimed water use for toilet flushing and fire protection in commercial or industrial facilities with approval from NCDENR. "Graywater" is defined as untreated wastewater, excluding toilet, dishwasher, and kitchen sink wastewaters. In North Carolina, graywater reuse is not allowed (15A NCAC 18A). With adequate treatment, graywater can be used on-site and is under the permitting of state/local plumbing authorities.

Both national plumbing codes [Uniform Plumbing Code (UPC) and International Plumbing Code (IPC)] require use of purple pipe for all alternate water on site. Alternate water is defined as reclaimed

water, harvested rainwater, graywater, stormwater, and air conditioning condensate. The 2012 UPC adopted an amendment at the final council meeting specifying text on purple pipe to be black for municipally treated and distributed reclaimed water. All other alternate waters onsite are to be in purple pipe with yellow text to distinguish the two sources of non-potable water. This can create some confusion if a utility provides reclaimed water to a new development that also has alternate waters with some or no treatment. The North Carolina Plumbing Code is based on the IPC and is the specific governing code for the Town. The 2012 North Carolina Plumbing Code specifically states in Chapter 6, Section 608.8.2: "The color of the pipe identification shall be discernable and consistent throughout the building. The color purple shall be used to identify reclaimed, rain, and graywater distribution systems." The Town's plans for providing reclaimed water within commercial and industrial developments should be coordinated with applicable local plumbing and building codes. The Town may also want to consider reinstating its annual recertification for plumbers for irrigation and plumbing training on cross-connection control.