ORANGE WATER AND SEWER AUTHORITY
Quality Service Since 1977

October 29, 2007

Mayor Kevin Foy
Town of Chapel Hill
405 Martin Luther King Jr. Blvd
Chapel Hill, NC 27514

SUBJECT: ANNUAL REVIEW AND UPDATE OF STRATEGIC TRENDS AND MASTER PLAN ISSUES

Dear Mayor Foy:

On behalf of the Board of Directors, I'm pleased to provide this year's update of OWASA's 2001 *Comprehensive Water and Sewer Master Plan* report. The purpose of these annual updates is to revisit key *Master Plan* elements and to note new information, data trends, or policy issues that may have changed or reinforced our original findings and recommendations.

The first portion of this edition provides strong evidence that reduced water demands observed during the past several years are genuine and sustained. Average drinking water production during the past four years decreased 10 percent from the preceding three-year average, while the overall OWASA system grew by more than seven percent during the same period. Other data indicate a strong relation between recent demand trends and residential construction starts in Carrboro and Chapel Hill. The most important strategic change from our original *Master Plan* has been the increased and continuing importance of water conservation and demand management as a critical element of OWASA's long-term water supply planning.

Roger Stancil has requested that we make a presentation to the Council about this information at your November 7, 2007 meeting. In the meantime, please feel free to contact Ed Kerwin (ekerwin@owasa.org; 537-4211) if you need assistance.

Sincerely,

Randy Kabrick, P.E.
Chair, Board of Directors

Attachment
c: Mr. Roger Stancil, Chapel Hill Town Manager
OWASA Board of Directors
Ed Kerwin, Executive Director

ORANGE WATER AND SEWER AUTHORITY

Quality Service Since 1977

MEMORANDUM

TO: Board of Directors

THROUGH: Ed Kerwin

FROM: Ed Holland

DATE: October 19, 2007

SUBJECT: Annual Review and Update of Strategic Trends and Master Plan Issues

Summary

OWASA water sales and reservoir withdrawals for the past six years have remained below the historically high levels observed in 2001. Water withdrawals from University Lake and Cane Creek are 23 percent less in 2007 than were projected in OWASA's 2001 *Master Plan*. Average drinking water production during the past four years has decreased 10 percent from the preceding three-year (2000-2002) average, while the total number of OWASA meter equivalents grew by more than seven percent during the same period. Per-household residential consumption has decreased by more than 11 percent since 2001, and substantial reductions in summer peak demands continue to indicate that customers are generally using less water outdoors.

These reductions, which appear to be genuine and sustained, likely reflect important conservation initiatives implemented since 2002, including seasonal and (most recently) block water rates; year-round conservation requirements enacted by Carrboro, Chapel Hill, and Orange County; and a proactive community educational effort by OWASA. A portion of these reductions is also due to ongoing passive conservation that occurs when older plumbing fixtures are replaced by new more water-efficient appliances.

A continuing trend of lower peak flows at the Mason Farm Wastewater Treatment Plant during rainy periods suggests that OWASA's long-term efforts to systematically identify, repair, and replace older sewer lines and to remove inappropriate storm drain connections are successfully reducing the unwanted inflow and infiltration of stormwater into the sewer system.

Lower peak demands at both the water and wastewater treatment plants will delay the need for costly future expansions.

OWASA's projections of future demand are based on the approved comprehensive plans of Carrboro, Chapel Hill, and Orange County and reflect the most up-to-date information available regarding new development proposed for the University's central campus and Carolina North. Local rezoning decisions that are consistent with existing comprehensive plans are not expected to affect OWASA's demand projections. Additional development

density can be accommodated within the scope of OWASA's current plans if highly efficient water conservation technologies are implemented in new development projects. We are working with local government staffs to develop collaborative approaches for increasing water use efficiency in our service area.

The existing reservoir/quarry water supply system and its future expansion can meet the ultimate buildout needs of the Carrboro/Chapel Hill/University community. However, if projected demands are not reduced further and/or additional water supply sources are not developed, the community will become more vulnerable to severe drought conditions beginning in the early 2020s until the Stone Quarry expansion is available for water storage in the early 2030s. The primary goal of OWASA's long-range conservation program and the reclaimed water system is to reduce water shortage risks without having to rely on additional water from Jordan Lake.

Water quality in OWASA's University Lake and Cane Creek Reservoir remains good, but not pristine, as indicated by periodic blooms of blue-green algae, especially in University Lake. Bloom conditions appear to be aggravated by prolonged summer periods of high temperature and low streamflow, and both reservoirs remain sensitive to nitrogen and phosphorus inputs from their respective watersheds. It is possible that these reservoirs may be subject to regulatory action in the future due to periodic exceedances of North Carolina water quality standards for chlorophyll *a*, an indicator of algae and nutrient enrichment.

A $50+ million upgrade and expansion of the Mason Farm Wastewater Treatment Plant was recently completed. New and upgraded treatment units have already improved the quality of water released to Morgan Creek and have increased plant reliability, eliminated odor problems, and enabled the reuse of treated effluent to meet certain non-drinking water needs. An environmentally friendly ultraviolet light unit has replaced the former chlorine-based disinfection system.

The wastewater project included $11 million for facilities to remove nitrogen and phosphorus to the proposed Jordan Lake nutrient limits, which represent the current limits of technology. The wastewater plant can now meet those requirements – at least until it reaches its new capacity of 14.5 million gallons per day (mgd). Without significant technological advances, OWASA may not be able to meet the proposed nitrogen limit when average day wastewater flows exceed 14.5 mgd, at which time it may be necessary to restrict additional connections to the wastewater system.

Our practice of applying liquid biosolids (highly treated wastewater sludge) to agricultural land has become limited by weather conditions, cropping schedules, land availability, increasing biosolids volume, transportation costs, and other operating factors. Several emerging issues and trends could affect the future viability and capability of this management approach and indicate the need for a more diversified program. The recently completed installation of biosolids dewatering equipment at the wastewater plant provides a "gateway" technology for improved flexibility and reliability of OWASA's biosolids program, because dewatering is a necessary next step toward any viable future option. OWASA recently entered into a five-year contract with a private firm who will provide composting services for dewatered biosolids and market the composted end-product.

Introduction and Background

OWASA completed a *Comprehensive Water and Sewer Master Plan* in 2001, combining previously separate elements of planning and operations information into a single "road map for the future." Overall findings of the *Master Plan Final Report* and related *Technical Memoranda* were highlighted in the December 2001 *Capstone Report*.

Annual review and update reports were provided to the Board of Directors in four subsequent memoranda:

- September 19, 2003
- October 22, 2004 (revised)
- October 21, 2005
- October 20, 2006

This present memo updates last year's report with more recent data plus additional commentary where appropriate.

These annual updates are intended to revisit key *Master Plan* elements and note any new information, data trends, or policy issues that might either change or reinforce original *Master Plan* findings or recommendations. The update memos follow the same basic question and answer format as the 2001 *Capstone Report* with a focus on items of the most strategic, rather than simply informational, importance. For example, the annual updates emphasize questions such as "How much more water will be needed in the future?" or "What future options do we have?" rather than "How is our water treated?" or "Where does our water come from?" – unless, of course, significant changes have occurred or are proposed for those areas.

Assumptions

What basic assumptions about future growth were used in OWASA's Master Plan?

The 2001 *Master Plan* projections were based on the underlying assumptions of several important policies and principles. It has been noted that if any of these are changed significantly – either by circumstances or public intent – substantial modifications to the *Master Plan* and subsequent update reports would likely be needed. The major assumptions and policies applied in the original 2001 *Master Plan* are listed below. Any changes or modifications that have since been incorporated into the current update are discussed in appropriate sections of this memo.

1. OWASA's long-term service area, defined by the urban services boundaries of Carrboro, Chapel Hill, and Orange County, will remain unchanged during the 50-year planning period.

2. OWASA will serve only the current service area over the next 50 years. Water demand forecasts do not anticipate any retail or wholesale water or wastewater service outside of this area.

3. The moderate and very linear growth rates experienced from 1977 through 2000 were expected to continue. In the absence of 2050 population and employment projections from Carrboro, Chapel Hill, and Orange County, the demand forecasts in the *Master Plan* were based on linear extrapolations of historical housing, employment, and development trends.

   Master Plan estimates of future residential water and sewer service demands for non-University growth were based on 2050 housing estimates that actually exceeded Carrboro's and Chapel Hill's buildout projections by more than 20 percent. In other words, *Master Plan* forecasts for residential water/sewer demands (which comprise 55 percent of OWASA water use) were conservatively based on buildout estimates that were already known to be higher than those anticipated by local planners.

4. Due to the limited amount of land available for future growth and development under the existing plans and policies of Carrboro, Chapel Hill, and Orange County, the *Master Plan* assumed that OWASA's service area would be built out to currently planned development densities sometime within the 50-year planning period, but neither the timing nor rate of growth was known with any degree of certainty. It is important to note that OWASA's demand projections continue to be based on planned development densities within the currently approved urban services boundary.

Recent and Anticipated Development Trends

Several trends in the Carrboro-Chapel Hill Urban Services Area have become apparent since OWASA's *Master Plan* was compiled in 2001:

- A decreasing supply of raw land available for new residential and commercial development is causing a shift from traditional development patterns toward more infill and redevelopment at higher densities than has occurred in the past.

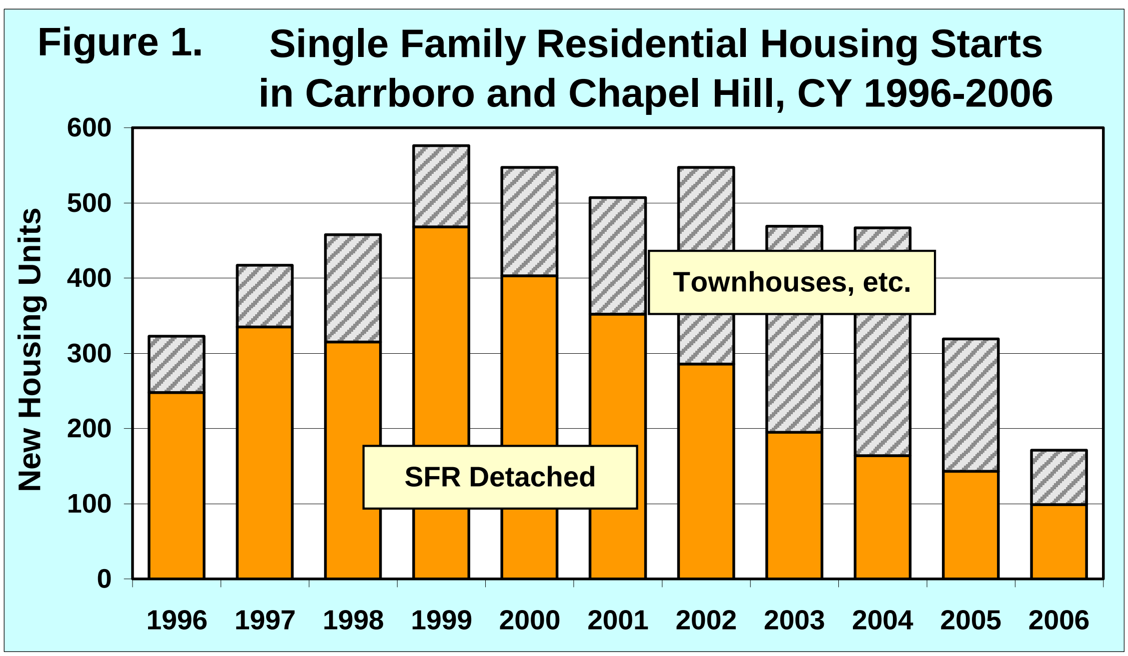
- The number of detached single family homes constructed on large undeveloped lots appears to be declining from the stable rate of about 350-400 new homes per year observed since the early 1980s. More single family residential construction is occurring on smaller lots; a greater number of older homes are being renovated and/or expanded; and, more requests are being filed for tear-down redevelopment and/or subdivision of existing in-town lots.

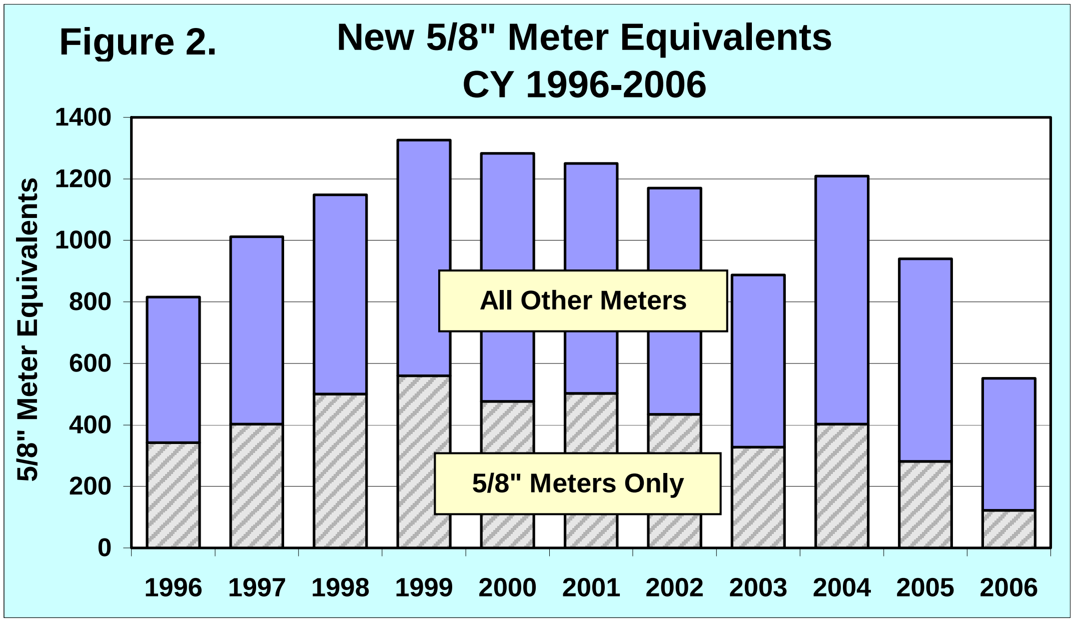
- Consistent with these observations is an increasing proportion of new attached, townhouse style residential construction as well as more permit applications for high density mixed use residential/commercial projects. Detailed plans are underway for mixed use re-development projects in Carrboro (the new Arts Center complex, Butler property, Calvin Mellott property, Concrete Plant Site (the undeveloped portion)) and in Chapel Hill (Lot 5 Redevelopment, University Village, Greenbridge, East 54, and others).

- Based on existing water use data, we expect the shift toward smaller residential lot sizes and more townhouse/multi-family construction to result in decreased demands per unit for OWASA water and wastewater service.

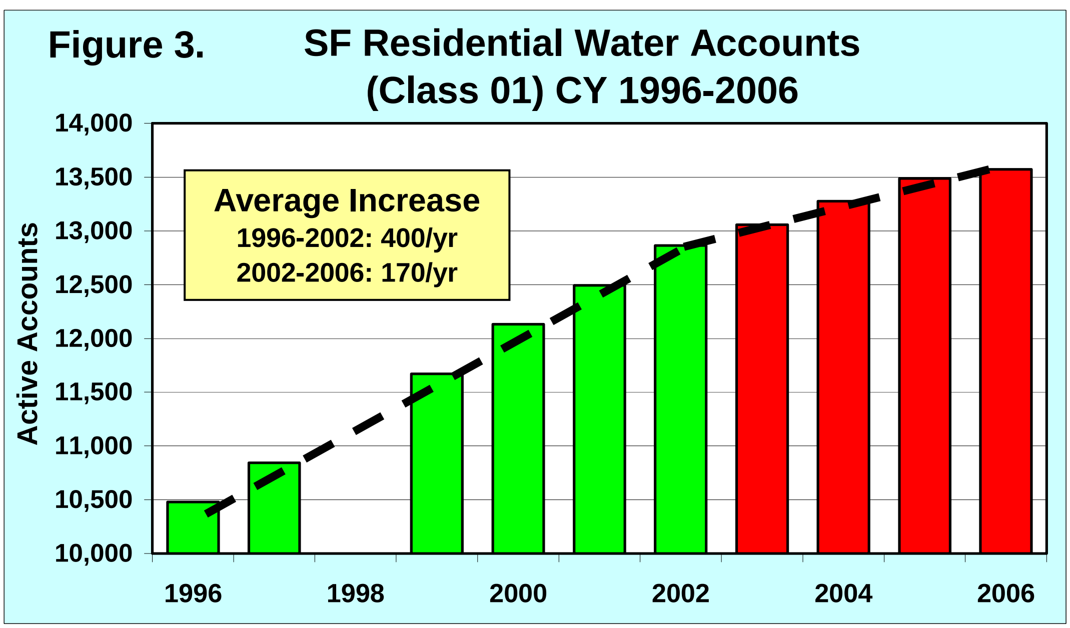
Examples of these trends and their relation to water and sewer demands are illustrated on the following pages.

Figures 1 and 2 illustrate the declining trend in traditional single family (SF) housing starts in the OWASA service area, as well as the relationship between new SF detached homes and new water meter installations. Single family homes are typically served through the smallest (5/8-inch) meters, while larger users are served through larger meters, whose capacities are expressed in proportional equivalents of a 5/8-inch meter, or "meter equivalents" (MEs).

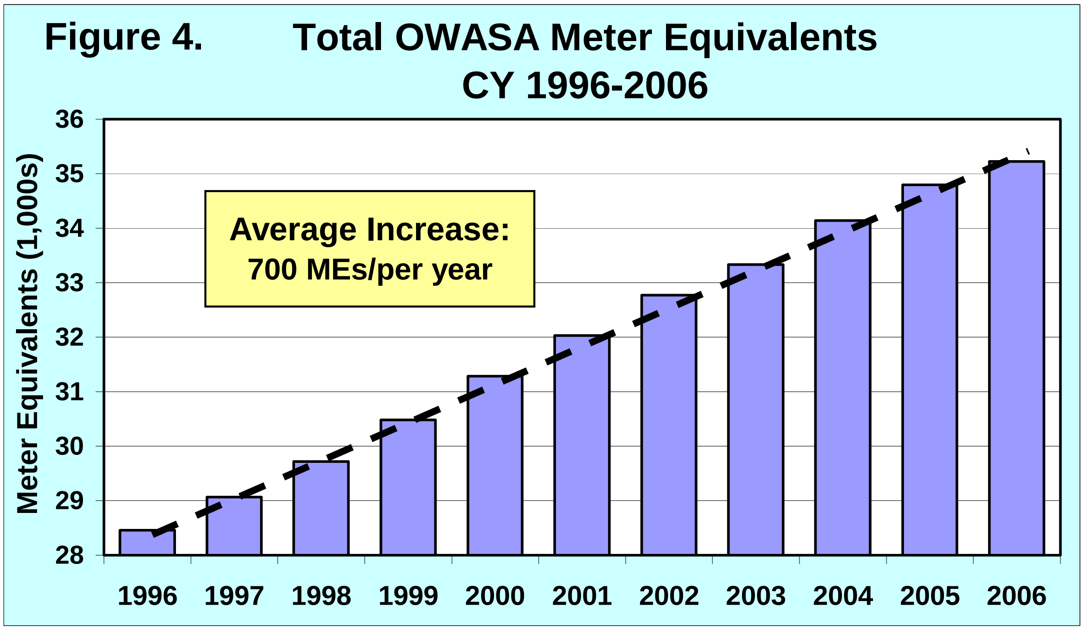




The trend of declining single family detached residential development is similarly evident in the recent reduction in the rate of increase of OWASA customer accounts in the "01" user category of our billing system records.

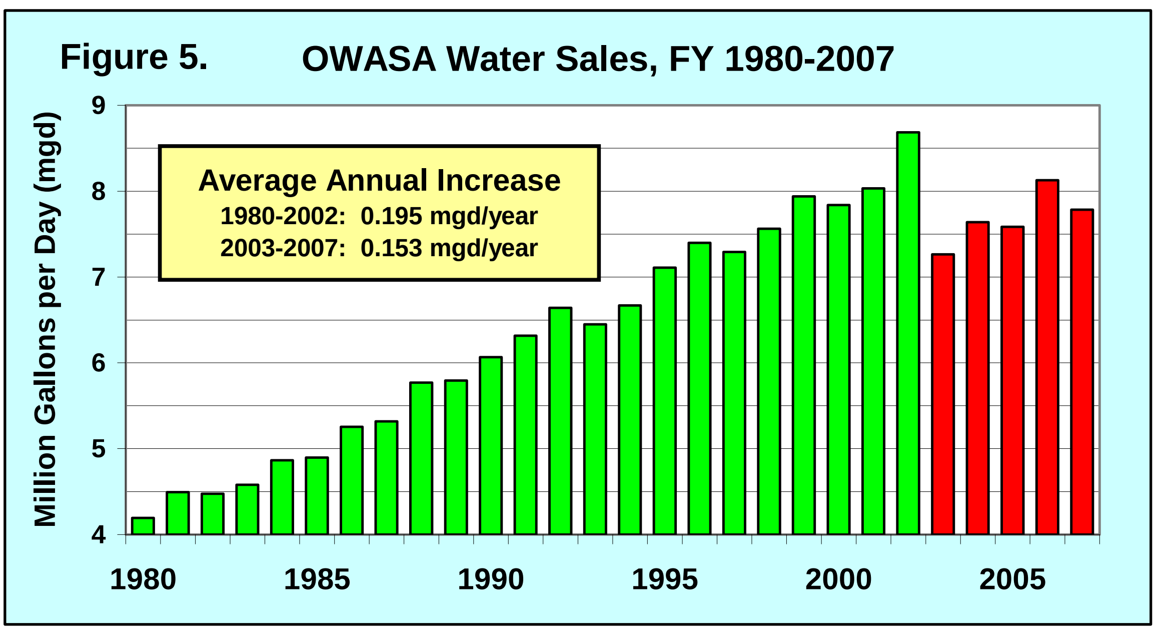


Despite this decline in single family housing starts, the installation of total OWASA meter equivalents has remained constant and robust, as shown in Figure 4. This likely reflects non-SF residential development, especially new construction on the UNC campus, and indicates OWASA's continuing growth.

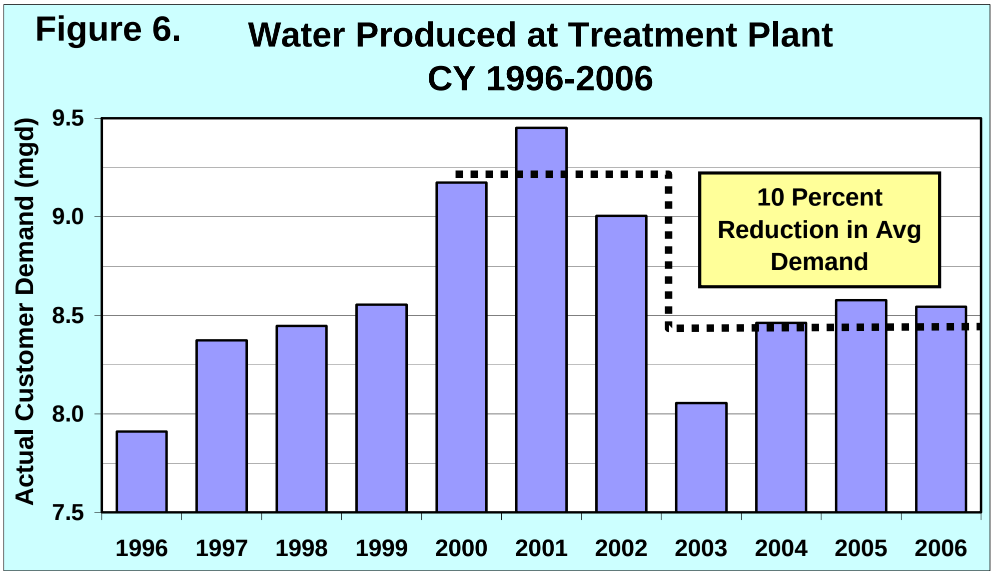


Water Demand Trends

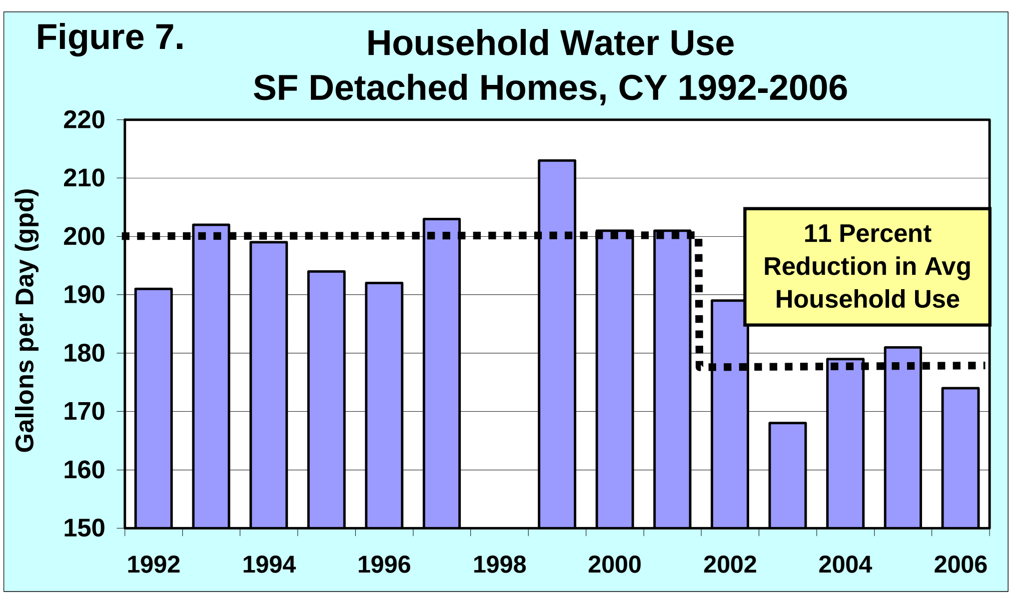
Substantial demand reductions have been observed and sustained since 2002. Figure 5 illustrates the declining rate of OWASA water sales growth from a 23-year average of nearly 0.20 mgd per year from 1980-2002 to 0.15 mgd per year during the past five fiscal years.

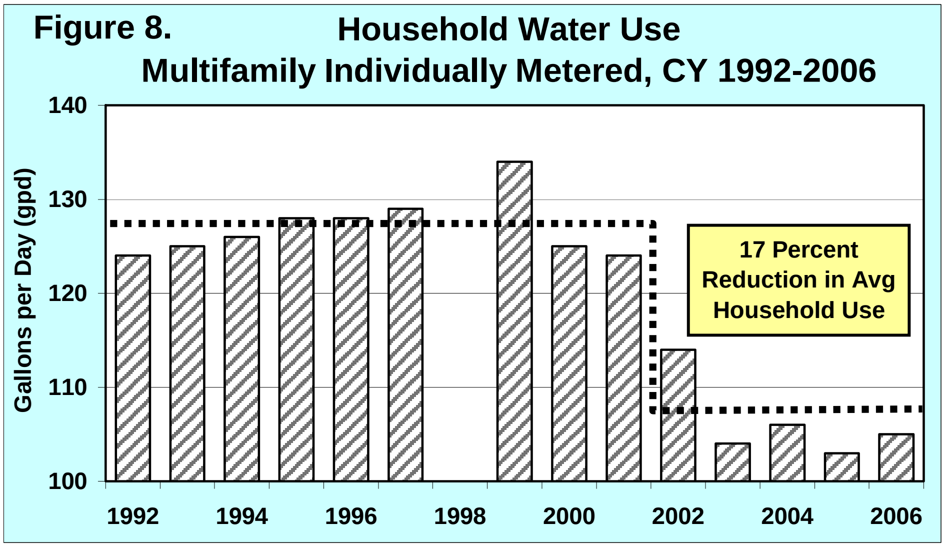


As shown in Figure 6, average drinking water production during the past four years has decreased 10 percent from the preceding three-year (2000-2002) average.



Figures 7 and 8 illustrate significant reductions in per-household consumption during the past five years. Water use by single family detached households decreased 11 percent from an average of 200 gallons per day (gpd) during the 1992-2001 period to 178 gpd during the past five years. Multifamily individually metered household consumption (townhouses, condominiums, and some apartment complexes) decreased 17 percent from 127 to 106 gpd during the same period.

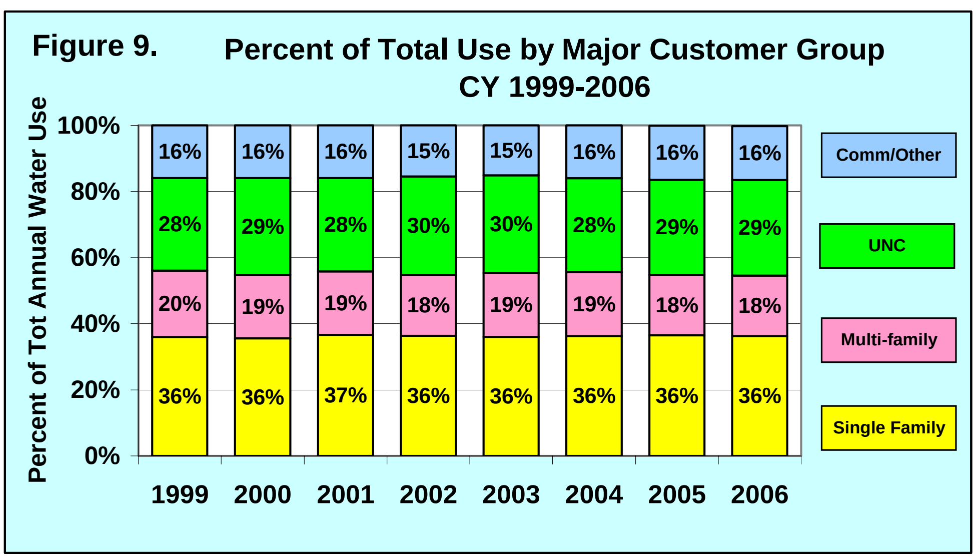




Although the decrease in this latter category was proportionally greater than the decrease for single family detached homes, the average absolute reductions of 22 and 21 gpd were virtually identical for both housing categories.

Water demand reductions observed since 2002 appear to be genuine and sustained. The total number of OWASA meter equivalents grew by more than seven percent from 2003 through 2006, while average water demand for that period decreased by 0.8 mgd, or nearly 10 percent, compared to the demand from 2000 through 2002.

The virtually constant pattern of proportional use since 1999 among the four major customer sectors indicates that these demand reductions have probably occurred among all OWASA customer classes (Figure 9).



Raw Water Supply

How will growth affect water and sewer demands?

Based on community trends observed since the mid-1970s and on information provided by Carrboro, Chapel Hill, Orange County, and the University, OWASA's 2001 *Master Plan* anticipated an approximate doubling of water and sewer demands by 2050. Shortly after the *Master Plan* was completed, the University announced plans for accelerated central campus development between 2002 and 2008 and, ultimately, for more intense buildout than anticipated in OWASA's *Master Plan*. Those more recent UNC growth plans resulted in revised projections of future water and wastewater service needs that were intermediate between the "expected" and "high growth" projections of OWASA's 2001 *Master Plan*. These adjustments were discussed in the September 19, 2003 *Master Plan* update memo and are reflected in current demand projections.

Demands for UNC's Carolina North development were included in OWASA's 2001 *Master Plan* projections, and a "placeholder" demand of 1.6 mgd for Carolina North continues to be reflected in our current demand projections, which represent the best information available at this time. It is likely that our estimates will be updated during the coming year as the University submits Carolina North development plans for local approval.

Long-term demand projections for non-University customers are not expected to exceed OWASA's 2001 *Master Plan* projections unless major changes occur in the growth plans and development policies of Carrboro or Chapel Hill; e.g., significant increases in allowable density, permitted land uses, or changes to the long-range urban service boundaries established by Carrboro, Chapel Hill, and Orange County. Although the pace and timing of growth in the community and on campus may result in short-term departures from OWASA's projected demand trends, these are not expected to affect our long-term estimates of water and sewer system capacity needs. OWASA's projected demand curves will be reviewed and refined as more detailed growth plans are developed by the local governments and UNC. Overall water demand is expected to increase by 40 to 57 percent between 2008 and 2035, depending on how much passive conservation and water reuse is achieved during this period. It is notable that the combined population increase of Chapel Hill and Carrboro from 2005 to 2035, as forecast in the March 2007 *Draft Durham-Chapel Hill-Carrboro Metropolitan Planning Organization 2035 Long Range Transportation Plan Socio-Economic Projections* is estimated to be 47 percent, which is well within the range of our water demand projections.

OWASA prepared a discussion paper entitled *Water and Sewer Capacity Implications of Increased Density in OWASA's Carrboro-Chapel Hill Service Area, February 22, 2006* in response to a request by the Chapel Hill Town Council. The report concluded that OWASA can meet the water needs of increased development density within the currently defined urban services area of Carrboro and Chapel Hill through the greater use of highly efficient conservation technologies that are currently available. The report also noted that the ultimate capacities of OWASA's facilities were based on projections of future demands that correspond to housing and employment levels that exceed Carrboro's and Chapel Hill's buildout projections by more than 20 percent, thus providing a conservative margin of safety for meeting the capacity needs of future development.

Pursuant to that report, OWASA staff is continuing to work with Carrboro, Chapel Hill, and Orange County staffs toward collaborative approaches for increasing water use efficiency in new and existing development.

Can future water and sewer needs be reduced through more water conservation?

It is likely that the significant demand reductions described earlier reflect OWASA actions that were initiated after the *Master Plan* and the drought of 2001-2002. These included:

- Seasonal water rates (2002).
- New conservation standards and year-round requirements and new local water conservation ordinances adopted by the Towns and County (2003).
- A comprehensive written report on different conservation management practices (2003).
- Implementation of a permanent system for recycling process water at OWASA's water treatment plant (2005).
- Policy-level adoption of specific water conservation goals and objectives (2005).
- Contract with UNC to establish a reclaimed water system that will reduce long-term potable water demands by about six percent beginning in 2009 and by up to 14 percent by 2028.
- Introduction of increasing block water rates with drought surcharges for all individually-metered residential customers (2007).

The role of an active OWASA conservation program – including the reclaimed water system project – became a key element of our long term water supply plans and is a significant strategic change since the *Master Plan* was completed in 2001. This was formally recognized with the Board of Directors' adoption of a *Goal and Objectives for OWASA's Long-Term Water Conservation and Demand Management Program* in April 2005. An important focus of the *Goal and Objectives* is "eliminating the need for costly new water supply sources and facilities." In addition to specific demand targets, the document establishes guidelines for cost-effectiveness, customer satisfaction, and fiscal impacts that are to be weighed when new conservation and demand management programs are contemplated. The Board intends to revisit the *Water Conservation Goal and Objectives* periodically and will revise them as necessary to reflect changing conditions and new information that becomes available.

As of this writing, the current drought of 2007 is predicted to persist into 2008 and has highlighted the distinction between conservation and demand management as an integral part of OWASA's long-term water supply strategy, versus the more short-term focus of most drought management programs. One result of a successful (long-term) demand management efforts is the fewer number of opportunities for additional reduction during water shortages. Our community's commitment to year-round water use restrictions, such as the three-days-a-week limit on spray irrigation, is an example. The current drought is providing valuable experience and opportunities to modify and improve our local conservation ordinances in advance of the next drought, and to re-visit OWASA's and our customers' perception of risk and water supply reliability.

Have raw water demands been consistent with the *Master Plan* projections?

Projected and actual raw water demands (water pumped from OWASA's reservoirs) from 2000 through 2007 are presented in Table 1 and Figure 10. The overall decrease noted since 2001 has continued through 2007. The process water recycling program at our Jones Ferry Road Water Treatment Plant has permanently reduced raw water demands by more than 0.6 mgd since its inception in September 2002.

What is "process water recycling?"

The water treatment process requires a certain amount of water for washing filters and removing sediment from treatment units. Before September 2002, this process water accounted for six to ten percent of the total water pumped from our reservoirs to the water treatment plant and was discharged to a nearby stream.

Table 1. Raw Water Demands and Recycled Treatment Plant Process Water

Calendar Year	Projected Demand per Master Plan	Actual Demand	Variance		Recycled WTP Process Water
	(MGD)	(MGD)	(MGD)	(%)	(MGD)
2000	9.68	9.78	0.10	1%	0
2001	9.86	10.16	0.30	3%	0
2002	10.04	9.55	(0.49)	(5%)	0.26 [(a)]
2003	10.22	8.21	(2.01)	(24%)	0.68
2004	10.40	8.69	(1.71)	(20%)	0.59
2005	10.58	8.66	(1.78)	(20%)	0.60
2006	10.76	8.59	(2.17)	(25%)	0.61
2007	10.94	8.91 [(b)]	(2.03) [(b)]	(23%) [(b)]	0.58 [(b)]

(a) Process water recycling did not begin until September 2002. The 12-month average for CY 2002 was 0.26 mgd. The 4-month average while the system was operating (September - December 2002) was 0.78 mgd.

(b) Data available through September 2007 only.

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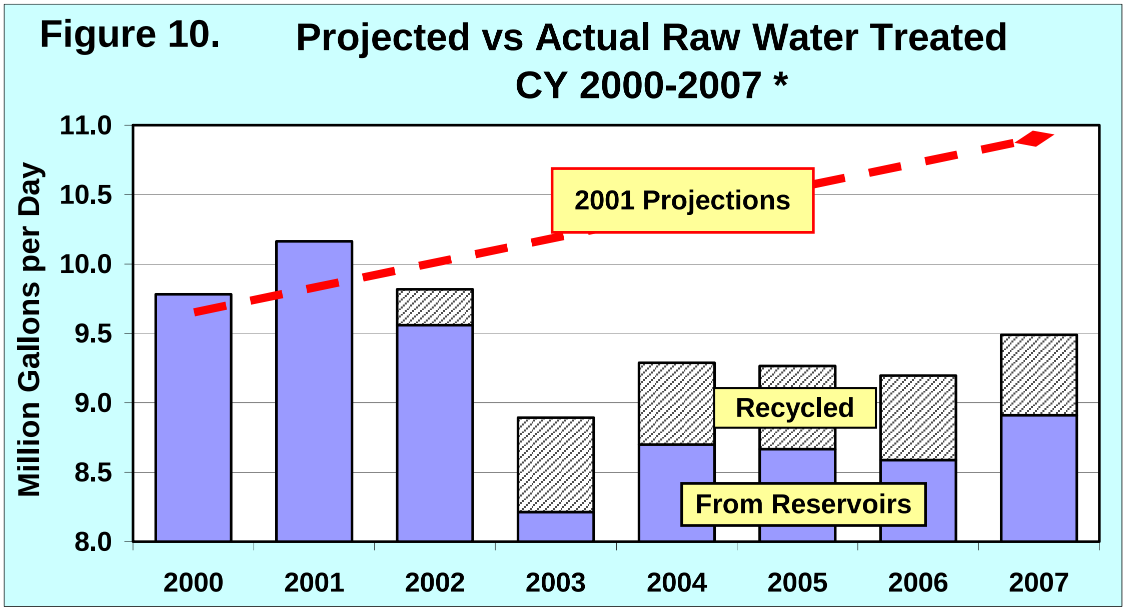


* Data are reported for Jan-Dec calendar years, except 2007, where data are only available through September.

Since the 2001-2002 drought, OWASA has recycled this treated process water back through the plant – rather than discarding it – thus reducing demands on the Cane Creek and University Lake reservoirs and energy use for pumping raw water. State regulations limit this recycled process water to a maximum of 10 percent of total water treated each day.

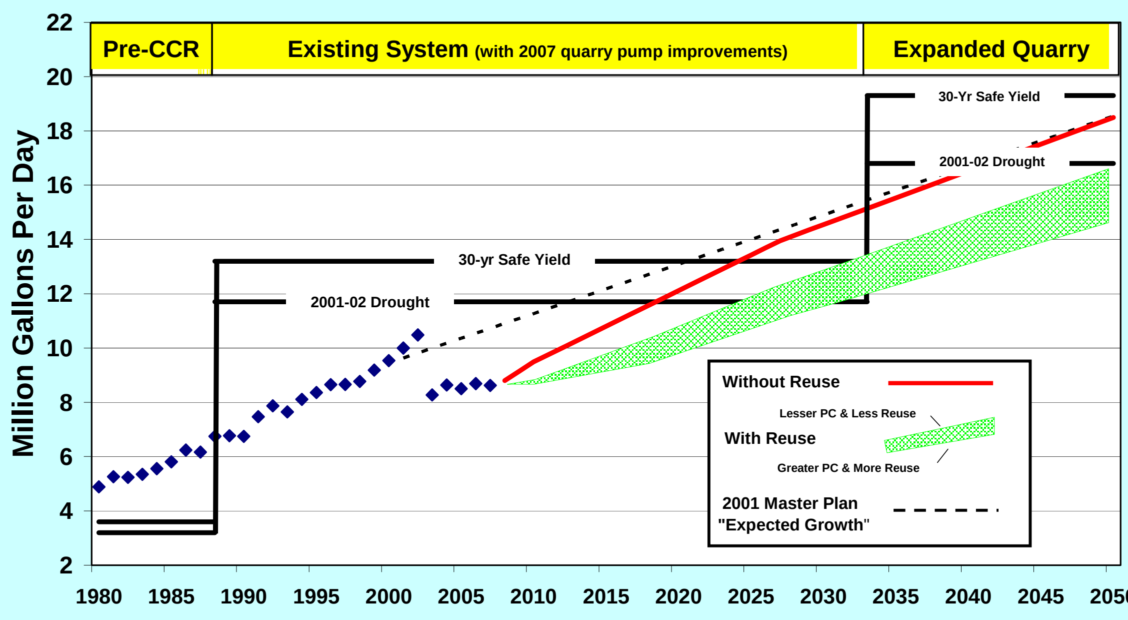
Table 1 and Figure 10 present raw water demand trends since 2000 and the role of process water recycling in reducing overall withdrawals from OWASA's reservoirs. As indicated in Table 1, a combination of treatment plant recycling and reduced customer demands has resulted in *reservoir withdrawals that are 23 percent less in 2007 than projected in OWASA's original 2001 Master Plan.*

How much more raw water will be needed in the future?

The *Master Plan* projected an ultimate (2050) raw water demand of 18.5 million gallons per day (mgd). The additional main campus University growth noted above represented a potential increase in demand of 3.3 mgd not anticipated in the *Master Plan*, which would have corresponded to a total system demand of 21.8 mgd in 2050. This was close to the original *Master Plan*'s "high growth" demand scenario.

Those 2001 projections did not, however, incorporate the potential effects of demand reduction through passive conservation resulting from the use of water-saving plumbing fixtures in new construction or the gradual replacement of older inefficient fixtures in existing buildings. The continued recycling of water treatment plant process water and implementation of the UNC reclaimed water system in 2009 are expected to reduce previously projected 2050 raw water needs to an ultimate demand in the range of 14.5 and 16.5 mgd, depending on eventual levels of reclaimed water use, passive conservation, and Carolina North demands (Figure 11). *It is notable that this estimate of 14.5 to 16.5 mgd is 10 to 20 percent less than the original Master Plan "expected growth" demand projection.*

Figure 11. Raw Water Supply, Demand, and Potential Deficits



Assumptions: **Revised 10/9/07**

Eventual quarry storage volume = 2.4 - 3.0 billion gallons.
UNC water reuse demands per McKim & Creed Technical Memorandum of 9/8/05.
Rate of UNC Main Campus demand increase:
2008-2009: 0.174 mgd/yr
2010-2026: 0.060 mgd/yr
2027-2050: 0.000 mgd/yr
Rate of UNC Carolina North demand increase:
2010-2050: 0.038 mgd/yr (assumes no reuse)
Lesser Passive Conservation (PC) & Less Reuse: Non-UNC demands increase at 0.135 mgd/yr; UNC reuse demands in the lower (lesser) range.
Greater PC & More Reuse: Non-UNC demands increase at 0.106 mgd/yr, and UNC reuse demands are in the higher (more reuse) range.
Without Reuse: Non-UNC demands increased at 0.145 mgd/yr (same as in previous projections), and no UNC reuse occurs.

Several new residential/commercial (mixed use) infill projects have been proposed for downtown Carrboro and Chapel Hill at higher development densities than currently allowed under local ordinances. By themselves, these projects will not measurably affect the overall demand for OWASA service. If the local communities decide to rezone larger areas for higher development density, any additional utility service demands could be offset through the use of highly efficient water conservation technologies that are currently available, as discussed in OWASA's February 22, 2006 discussion paper *Water* *and Sewer Capacity Implications of Increased Density in OWASA's Carrboro-Chapel Hill Service Area.*

What is the OWASA/UNC reclaimed water program?

In April, 2006 OWASA and UNC entered into a contract to develop a reclaimed water system that will deliver highly treated wastewater from the Mason Farm Treatment Plant to meet some of the major non-potable (non-drinking) water demands on the University's main campus, especially in cooling towers at the chilled water plants. Reclaimed water may eventually be used for irrigation of turf and landscaped areas, toilet flushing, boiler and cooling tower make-up water at UNC steam plants, and other uses allowed by State regulations.

The planned system will include a reclaimed water pump station and storage tank at the wastewater plant plus approximately 3 miles of reclaimed water distribution lines. The first phase of the system, which will include the new facilities at the wastewater plant, a 24-inch reclaimed water transmission line to the southern part of the campus, and reclaimed water pipes on the main campus, will cost more than $10 million. At startup, the initial reclaimed water demand will be between 0.57 and 0.66 mgd, or about five to seven percent of OWASA's total projected demands. In later phases, reclaimed water lines will be extended to serve the northern part of the campus, and by 2028 the demand for reclaimed water is projected to be at least 1.3 to 1.9 mgd, or about 10 to 14 percent of OWASA's total demand.

As agreed to in the OWASA/UNC contract, the reclaimed water project will be financially self-supporting. The University will fund all necessary capital improvements, and OWASA will recover all related production and overhead costs through reclaimed water rates and fees. The system is scheduled to begin operating in early 2009.

Will OWASA have enough water in the future?

The 2001 *Capstone Report* answered this question with an unqualified "Yes!" As reported in previous updates, the answer is still "Yes," but without the exclamation mark, and perhaps now including an asterisk or footnote to reflect the 2001-2002 drought and subsequent results of a more detailed hydrologic model of OWASA's quarry/reservoir system.

Original *Master Plan* calculations of water available from OWASA's University Lake/Cane Creek/Quarry Reservoir system were based on estimates of 30-year safe yield; i.e., the amount of water that the system can produce on an average daily basis throughout the year during drought conditions expected to occur about once every 30 years. The drought of 2001-2002, however, represented substantially more severe low streamflow conditions than the 30-year event. The extreme effects on reservoir drawdown and the increasing possibility that the reservoirs might become totally depleted suggested that water supply plans based on 30-year safe yield estimates might not offer as much reliability as the community desires. Subsequent estimates and illustrations of water supply capacity have therefore depicted OWASA's present and future water system in terms of both the 30-year safe yield and the 2001-2002 drought, which represents the worst case on record for OWASA's reservoir system. An improved hydrologic model of the reservoir/quarry system based on daily, rather than monthly streamflow data, was completed in 2004. The updated model indicated that previously planned improvements to OWASA's raw water pumps and transmission mains would not provide the additional yield reported in the 2001 Master Plan. Implications of those findings were discussed in the September 19, 2003 update memo and have been incorporated into OWASA's Capital Improvements Plan (CIP).

Because our reservoir model is based on historical streamflow records, it cannot account for potential effects of global climate change on the future hydrologic behavior of our local system.

How much water can the existing reservoir/quarry system provide?

The 2001 *Master Plan* reported that the existing Cane Creek/University Lake/Quarry Reservoir system could sustain a yield of 11.2 mgd under drought conditions that were estimated to occur once every 30 years. The subsequent detailed hydrologic model indicated that with optimized operation, the system (including the recently completed Stone Quarry pumping improvements) can now provide 13.6 mgd under estimated 30-year drought conditions, but would have sustained a yield of only 11.7 mgd during the 2001-2002 drought.

How long can the existing supply meet projected needs?

As shown in Figure 11, raw water demands are projected to approach the system's safe yield (assuming 2001-2002 drought conditions) in the mid-2020s.

The alternative demand curves in Figure 11 illustrate the significance of the OWASA/ UNC reclaimed water program on the overall reliability and adequacy of our water supply. The reclaimed water system will begin operating in 2009 and may enable OWASA to reliably meet projected demands through the early 2030s under 30-year drought conditions, or late 2020s under 2001-2002 drought conditions. Demand projections will continue to be refined as community-wide conservation trends continue to emerge and as further decisions are made by the University and UNC Hospitals about which facilities and irrigation uses will ultimately rely on reclaimed water. It may also be possible for OWASA to reduce future demands through additional comprehensive conservation measures.

What are OWASA's plans for obtaining additional water in the future?

Expansion of the Stone Quarry Reservoir by the mid-2030s and the use of OWASA's 5 mgd Jordan Lake water supply storage allocation remain the principal options for additional supply; however, the Board's *Goal and Objectives for OWASA's Long-Term Water Conservation and Demand Management Program (2005)* expresses our continued emphasis on conservation and demand management as our preferred supply-side resource.

OWASA's use of Jordan Lake would most likely occur through purchases of treated water via the City of Durham and its interconnection with the Town of Cary, which withdraws its supply from Jordan Lake. We are currently participating with Durham and Cary in a special study by UNC researchers to examine the extent to which interlocal water transfers may be less costly than building additional supply capacity. The project is addressing questions such as:

- How might Jordan Lake be most effectively used by several interconnected water providers?
- How might Durham, Cary, and OWASA take the fullest advantage of existing resources and infrastructure to meet desired levels of demand and drought protection?
- What additional increments of drinking water treatment and transmission capacity would be needed to meet those levels of demand and acceptable risk?
- Under what types of agreements or contracts might such an arrangement best be structured?

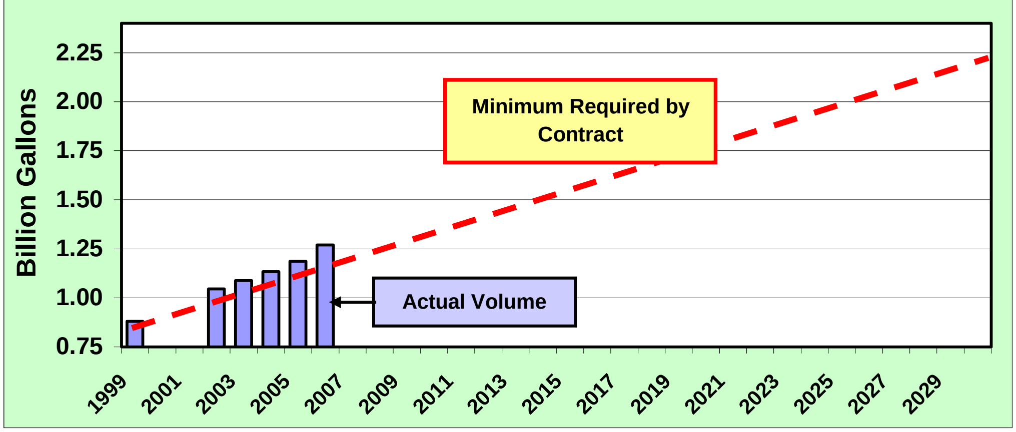
The financial, legal, and institutional dimensions of these issues will not be developed until the overall hydraulic and economic feasibility of such an interconnected system can be demonstrated at the "proof of concept" level, which is the main focus of this study.

Given the potential land use and growth implications, we recognize that the consideration of any such interlocal arrangement will not be made without the input and support of Carrboro, Chapel Hill, and Orange County officials.

When will the larger quarry be available?

The *Capstone Report* noted that the expanded Quarry Reservoir will not be available until the mid-2030s, after the American Stone Company has completed its mining operations and OWASA has converted the quarry for use as a drinking water reservoir. In order to ensure adequate storage volume by 2030, American Stone's agreement with OWASA includes a commitment to expand the active quarry site by extracting rock at an average rate of at least 487,500 tons per year, which is equivalent to about 42 million gallons per year of new storage capacity. As indicated in Figure 12, actual expansion below the 485-foot MSL elevation contour has occurred at a rate equivalent to about 50 million gallons per year for the seven years ending in December 2006, when total volume of the active quarry was calculated to hold 1.27 billion gallons. If it remains constant, the current rate of expansion will produce a final quarry volume (including OWASA's existing Quarry Reservoir) of approximately 2.4 billion gallons when mining ends in 2030.

Figure 12. Stone Quarry Storage Volume *



*** Volume of actively mined quarry below 485 MSL elevation. Estimates do not include 0.20 billion gallons available in existing Quarry Reservoir.**

How would we meet the water supply shortfall that could occur before 2030?

As noted above, our principal supply side option would likely be the collaborative use of Jordan Lake. No specific information is available at this time about the potential costs or contractual terms that might apply to such an interlocal arrangement, but it is certain that the cost of obtaining water from Jordan Lake either independently or in partnership with others will be much higher than our current water supply production and delivery costs.

The continued recycling of water treatment plant process water and start-up of the reclaimed water system with UNC are key demand-side elements of OWASA's long-term water supply plans. OWASA will continue pursuing cost-effective and practical water conservation measures to increase the reliability of our existing supply. As noted earlier, OWASA's primary conservation goal is *to avoid future shortfalls through cost-effective conservation and demand management initiatives.* Programs and practices in addition to those already in place will be fully evaluated during the coming years.

How clean is OWASA's source water?

Routine water quality monitoring and special projects completed since 2001 confirmed earlier findings cited in the *Capstone Report*: "OWASA's reservoir water quality is excellent in terms of public health and safety, but is not pristine." Accordingly, the Cane Creek Reservoir intake structure was modified to allow the selective withdrawal of the highest quality lake water. Since 2001, it was also determined that the potential benefits of additional in-lake manipulation of water quality (via mechanical aeration or other techniques) remain too uncertain to justify their relatively high capital and operating costs. A complete water quality survey that is conducted every four to five years for the reservoirs and tributaries was last completed in December 2005. Additionally, OWASA continues to participate in the Triangle Area Water Supply Monitoring Program, through which the United States Geological Survey (USGS) has compiled systematic data from University Lake, Cane Creek, and their principal tributaries since 1988.

The USGS released a special report in 2007 about the occurrence of so-called "emerging contaminants" in Triangle Area water supply reservoirs, including both University Lake and Cane Creek. Water samples from 7 local supply sources were analyzed for 126 chemicals, including a wide range of pharmaceuticals, antibiotics, ingredients in personal-care products, fire retardants and plasticizers, pesticides, and other chemicals used by households, industries, and agricultural enterprises. Trace amounts, generally in concentrations of less than 0.5 parts per billion, of at least one chemical were detected at all sampling locations, but none exceeded Federal or State water quality standards. Few standards exist, however, for the chemicals analyzed in this study. Concentrations were generally within the ranges observed in other USGS studies across the nation and provide useful background information about our own water supplies.

University Lake and Cane Creek Reservoir continue to meet all public health-related water quality standards.

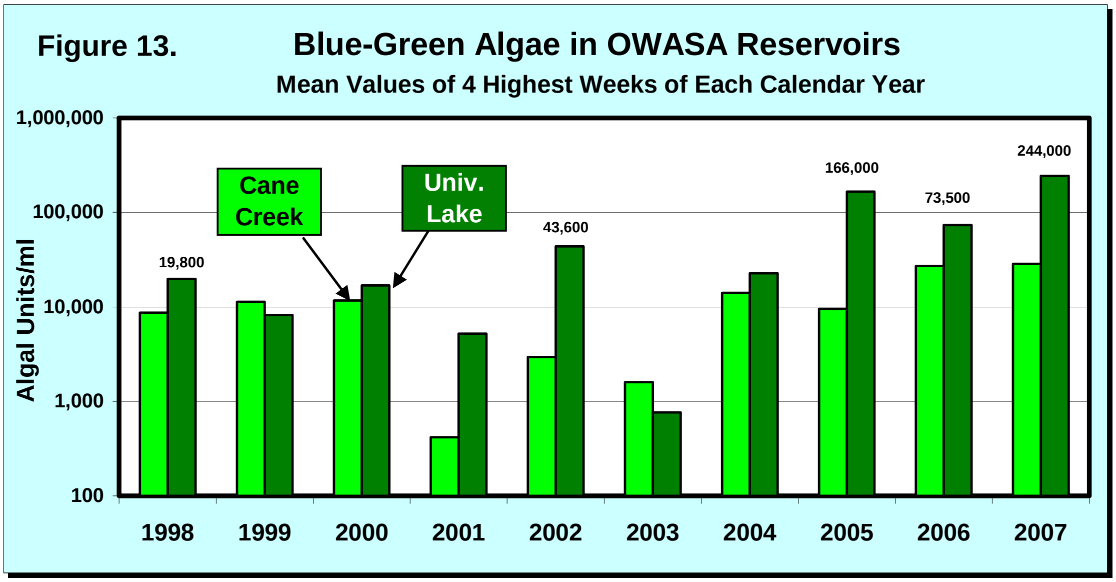
The Cane Creek watershed recommendations adopted by the OWASA Board of Directors in 1997 included a goal of acquiring ownership or conservation easements on 1,265 acres of additional land. A total 1,004 acres have been protected to date.

A 2003 study of potential water quality benefits of land/easement acquisition in the University Lake watershed determined that a similar program would not likely improve future water quality in University Lake. However, it was recommended that OWASA consider the strategic acquisition of critical riparian buffer lands in the University Lake watershed on a case-by-case basis. Accordingly, OWASA purchased a 74-acre tract immediately adjacent to Morgan Creek and University Lake when the property became available in 2006.

Funding for additional watershed land or easement acquisition was not included in OWASA's June 2007 Five-Year Capital Improvements Program due to budgetary constraints.

The principal water quality issues for Cane Creek and University Lake have been associated with the nutrients nitrogen and phosphorus, which stimulate excessive algal growth. Certain types of algae, especially cyanobacteria (formerly known as "blue-green algae"), may cause water treatment problems – taste and odor, filter clogging, coagulation problems, and so forth – when these organisms occur in high concentrations or blooms. Many of the same species also produce toxic organic compounds that are harmful to animals and humans under extreme conditions. Figure 13 presents average concentrations of blue-green algae in OWASA's reservoirs from 1998-2007.

No state or federal regulatory limits exist for algae, but water quality experts generally consider concentrations of more than 100,000 units per milliliter to indicate hypereutrophic conditions, or extreme nutrient enrichment. As seen in Figure 13, blue-green densities in University Lake exceeded this threshold in 2005 and again this past summer (2007) during prolonged periods of hot stagnant weather with little rainfall and low streamflows.



Each bar represents the arithmetic mean of the four highest concentrations of total cyanobacteria measured in weekly samples collected during each calendar year.

North Carolina enforces a water quality standard for chlorophyll *a*, which is used as an indicator of algal concentrations. Although the appropriateness of this standard remains subject to vigorous technical debate, it has been the basis of the NC Environmental Management Commission's (EMC) regulatory designation of Jordan Lake as water quality impaired. As we noted during recent public hearings on the proposed Jordan Lake nutrient management rules, University Lake and Cane Creek Reservoir periodically exceed the chlorophyll *a* standard during summer months, but none of the lakes' intended uses for public water supply or recreation have been impaired. It is possible that these reservoirs may be subject to regulatory action in the future.

OWASA will continue to explore alternative approaches for reducing nutrient loads, especially in the University Lake watershed and, in cooperation with other agencies, will promote the use of best management practices for nonpoint pollution control in both watersheds.

As a precautionary measure, University Lake and Cane Creek water samples have been analyzed during the past several summers for naturally occurring toxic substances that are sometimes produced by blue-green algae. All analytical results for the toxins microcystin, saxitoxin, cylindrospermopsin, and anatoxin-*a* were either less than their laboratory detection limits or well below water quality standards of the World Health Organization (no state or federal algal toxin standards exist in the U.S.).

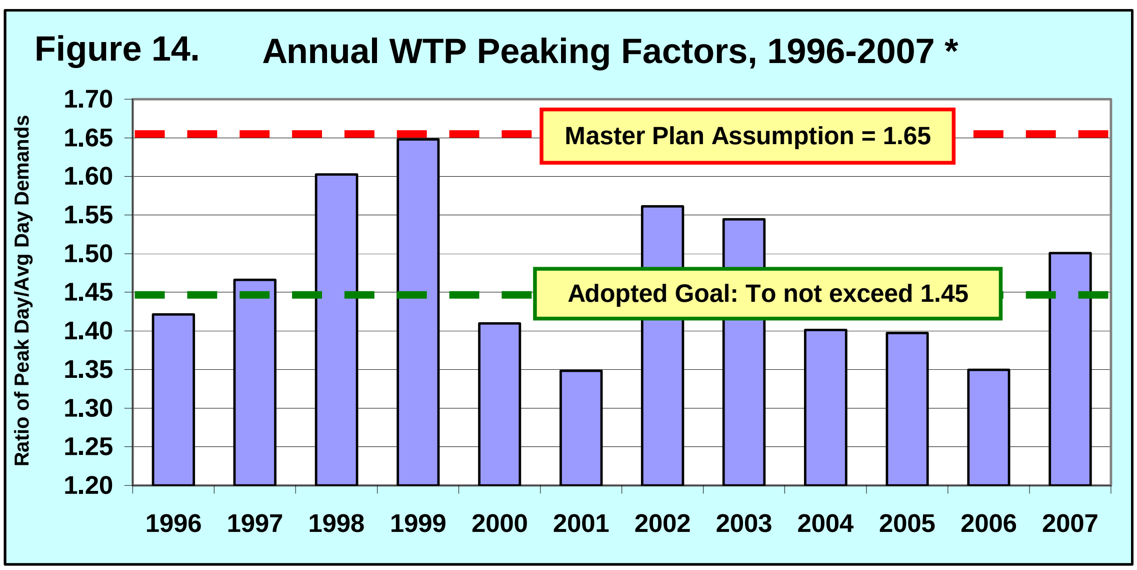
Water Treatment

Does OWASA have enough water treatment capacity?

Yes. Treatment capacity has been increased from 15 to 20 mgd since the *Master Plan* was completed in 2001. This was accomplished through the addition of two new filters, a new finished water pump, and improvements to the existing clearwell in order to provide the extended disinfectant contact time required for a flow rate of 20 mgd. Additional upgrades and improvements are planned in the coming years, but no further capacity expansions should be needed during the 15-year capital improvement period if the reclaimed water system is implemented as planned.

Why does treatment plant capacity have to be so high if customers use less than 10 million gallons of water each day?

The water plant must be able to accommodate short-term peak demands during periods of high use. The 2001 *Master Plan* recommendations for water plant expansion were based on a peaking ratio of 1.65 (maximum day demand divided by annual average water



* Data are reported for Jan-Dec calendar years, except 2007, where data are only available through September.

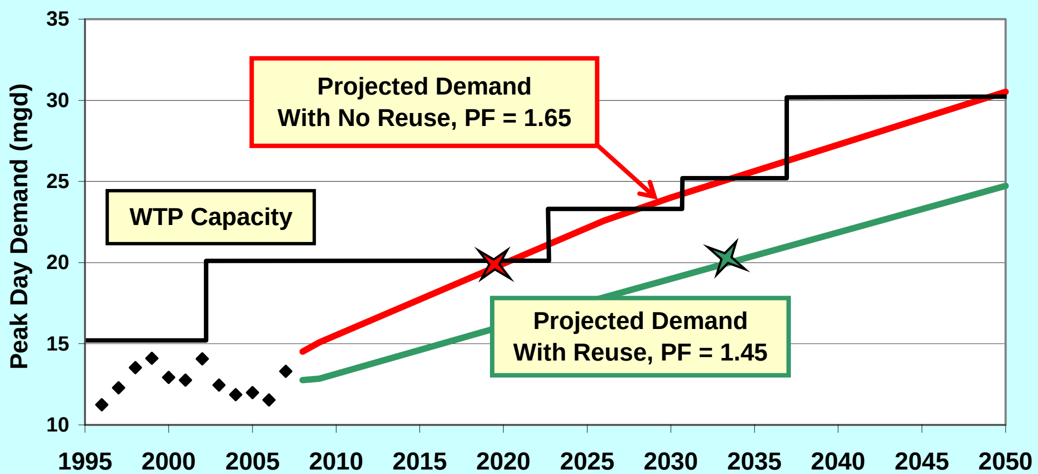
production). This recommendation was based on the most current information available at the time. Since then, peaking ratios have declined substantially as shown in Figure 14. The 12-year average of 1.47 is slightly below the traditional industry norm of 1.50.

Can we avoid or delay treatment plant expansions by practicing more aggressive water conservation and demand management?

Yes. By practicing commonsense conservation – especially for outdoor water use – customers can help limit the summer peak ratios to 1.45 or less, which is one of the specific conservation objectives adopted by the Board of Directors in 2005. Additionally, the OWASA/UNC reclaimed water program will help defer the next water plant capacity expansion by more than 10 years beyond the *Master Plan* projection.

The combined effects of reducing summertime peak demands and implementing the reclaimed water program are illustrated in Figure 15. Diamonds on the graph indicate actual peak day treated water demands for 1995 through 2007. Future peak day demands are shown for factors of 1.65, as assumed in the original *Master Plan*, with and without implementation of the reclaimed water project ("less reuse" is assumed here). The solid stepped line represents existing and future water treatment plant capacities. The red and green stars indicate the approximate years (2020 and 2033) in which peak demands would reach the plant's present capacity of 20 mgd under these different scenarios.

Figure 15. Peak Day Water Demand vs Treatment Plant Capacity



Additional water savings might be realized through other conservation and demand management practices, such as the replacement of older plumbing fixtures with newer water-saving versions, etc., but the projected demand reduction benefits and utility revenue impacts of their implementation need further evaluation.

How much drinking water treatment capacity will ultimately be needed?

The *Master Plan* projected the need for 30 mgd of water treatment capacity to support anticipated peak day demands at buildout of the OWASA service area, but as noted above, several important assumptions have changed since 2001: (1) increased estimates of University buildout demand; (2) decreased estimates of University potable water demand due to the reclaimed water program; and (3) potential decreases in peak day treatment needs due to planned conservation. Ultimate water treatment capacity requirements may be less than 30 mgd, but until future growth and community buildout trends, including the University's Carolina North project, become more clearly defined, and until the actual effects of the reclaimed water project can be measured, the 30 mgd estimate of ultimate treatment capacity remains a valid planning target. The existing site of the Jones Ferry Road Water Treatment Plant is large enough to accommodate future expansion to a 30 mgd facility.

Will the plant be able to meet new drinking water quality standards?

Yes. OWASA meets all federal and state drinking water standards for public health protection and aesthetic quality, and will be able to meet new standards, especially the "Long Term 2 Enhanced Surface Water Treatment Rule" (LT2ESWTR) and "Stage 2 Disinfectants and Disinfection Byproducts Rule" (Stage 2 DDBR).

LT2ESWTR reduces the risk of exposure to *Cryptosporidium* and other pathogenic microorganisms through strict control of turbidity (cloudiness caused by microscopic particles) in treated drinking water. LT2ESWTR standards require that average turbidity measurements not exceed 0.3 NTUs (nephelometric turbidity units) and that no single measurement exceed 1.0 NTU. During the past year, 100 percent of OWASA's measurements were less than 0.3 NTUs, with a highest single turbidity reading of only 0.20 NTU.

Stage 2 DDPR is intended to further reduce the exposure to chemicals produced when drinking water is disinfected with chlorine. The principal classes of disinfection byproducts regulated under this rule are total trihalomethanes (THMs) and five types of haloacetic acids (HAA5). The maximum allowable levels (annual average) of these substances will be 80 ug/L for THMs and 60 ug/L for HAA5. All of OWASA's measurements met these standards during 2006, with THM concentrations of 39.5 ug/L and total HAA concentrations of 34.4 ug/L. Concentrations of disinfection byproducts in OWASA's drinking water have decreased since disinfection with chloramines began in January 2002. This process adds ammonia, which combines with chlorine in the treated water to form compounds called chloramines that provide effective disinfection while producing fewer THMs and HAAs than the former chlorine system. The Jones Ferry Road Water Treatment Plant is expected to continue meeting both the turbidity and disinfection byproducts standards.

In response to customer requests, we tested tap water for lead in 41 homes and other locations during 2006. Lead concentrations were below the 3 parts per billion (ppb) analytical detection limit in all but one sample, which contained 4 ppb. The State and Federal regulatory limit is 15 ppb. During May 2007, OWASA voluntarily tested a random sample of 21 homes, businesses, and institutional buildings that were less than two years old to determine if there was a link between new plumbing systems and lead in the tap water. Concentrations in 15 of the buildings were below the detection limit and between 4.1 and 6.5 ppb in the other six.

The federal Safe Drinking Water Act (SDWA), as amended in 1996, requires the United States Environmental Protection Agency (EPA) to publish a list of contaminants every five years which, at the time of publication, are not subject to any proposed or promulgated national primary drinking water regulations. Contaminants on the list are known or anticipated to occur in public water systems and may require future regulation. The list currently includes about 10 microbiological and 50 chemical contaminants. EPA conducts research on the occurrence, health effects, analytical methods, treatment technologies, and treatment costs for contaminants on this list. EPA also develops drinking water guidance and health advisories and makes regulatory determinations for priority contaminants on the list. If the EPA adopts additional regulations to address other drinking water contaminants of emerging concern, OWASA may be required to undertake additional water plant improvements. To better meet future needs, we will keep informed of regulatory proposals, health effects and risk assessment studies, and advancements in water treatment technologies.

Drinking Water Storage

How much storage exists, and how much will be needed?

OWASA's five elevated tanks and the underground clearwell at the water treatment plant provide 8.0 million gallons (MG) of finished water storage. The 2001 *Master Plan* recommended the addition in 2008 of another 1.5 MG clearwell at the water plant in 2005 and a new 1.5 MG elevated storage tank on OWASA's 17-acre property west of Old NC 86 north of Carrboro to meet projected growth in the 740-foot pressure zone in the northern part of the service area. As discussed earlier, the observed and expected reduction in average and peak day demands to levels substantially below the *Master Plan* projections have allowed these future expansions to be deferred. A recently completed engineering study recommends that an additional 0.5 MG (rather than 1.5 MG) elevated tank will be needed in the 740-foot pressure zone, but not before 2020. The 1.5 MG clearwell addition at the water treatment plant has been deferred beyond the 2022 CIP planning period.

Drinking Water Distribution

Does OWASA's distribution system suffer from the "aging infrastructure" problems of other urban areas?

The 2001 *Master Plan* noted that OWASA's water and sewer lines are generally in better condition than the infrastructure of larger older cities. Beginning in 2002, the CIP included a series of projects to increase the rate of water line renewal and rehabilitation from two miles to five miles or more per year. A special study completed in 2003 examined the water line infrastructure in more detail and determined that OWASA's proposed program actually exceeded the optimum rate of renewal/rehabilitation. As a result, the renewal/rehabilitation rate was reduced to three miles per year in FY 2004 and to two miles per year in the FY 2006 program. Staff uses a detailed Geographic Information Systems (GIS) based prioritization model, which includes factors for pipe material, age, operating pressure, and other variables, to help identify the most critical water line replacement needs.

Wastewater Collection

Can OWASA's sewer system handle all of the community's wastewater?

The currently adopted CIP includes projects to expand the capacity of major portions of OWASA's largest sewer interceptor lines along Morgan Creek, Bolin Creek, and Meeting of the Waters Creek. These projects were recommended in the *Master Plan*, which also noted that certain portions of the sewer system are subject to large volumes of stormwater infiltration and inflow (I/I). These remain the focus of OWASA's sewer and manhole replacement/rehabilitation program.

How much of a problem is I/I?

Decreases in sewer peak flows measured at the Mason Farm Wastewater Treatment Plant in recent years indicate that I/I reduction efforts begun in the early 1990s have been successful. Since completion of the *Master Plan*, significant opportunities for further cost-effective I/I reduction have been, and continue to be, specified in greater detail through specially targeted sanitary sewer evaluation studies (SSESs) planned and funded through the CIP. Unlike many older urban areas, our community's wastewater collection system is separated from the storm drainage system, thereby minimizing the potential for I/I related sewer overflows. Illicit connections of private storm drains and private sewers to the public sewer system are occasionally discovered and removed.

Should OWASA be making greater investments in sewer line repairs and rehabilitation?

As with the drinking water distribution lines, the CIP commits additional resources to sewer line work in the coming years and supports the repair/rehabilitation of approximately four miles of sewer line per year. These projects are determined through basin-by-basin SSES analyses that focus on I/I problems and the structural integrity of the system.

OWASA's plans and provisions for funding and implementing long-term water and sewer system rehabilitation and replacement needs are more proactive, aggressive, and sustainable than many other utilities.

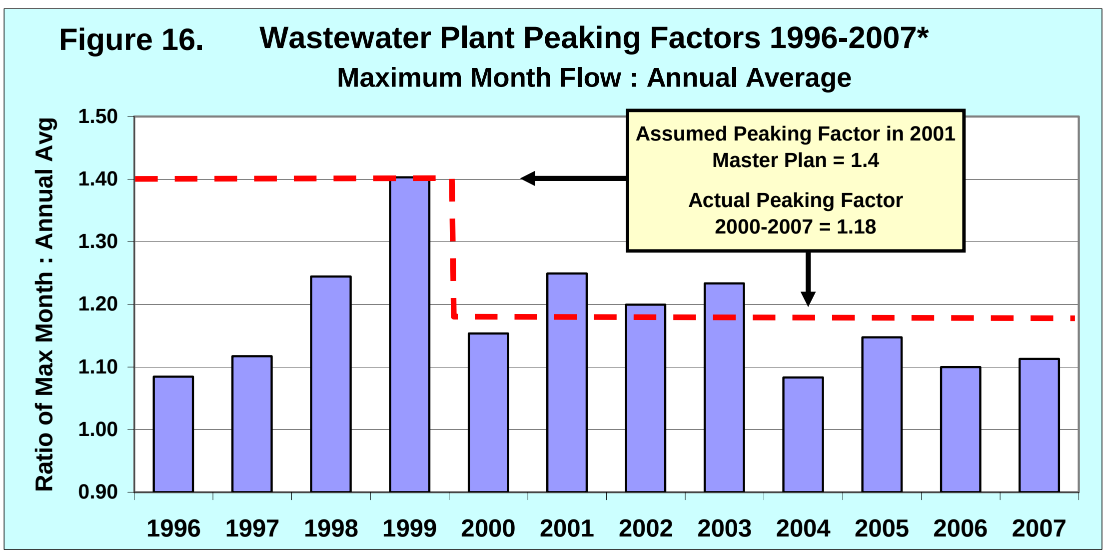
Wastewater Treatment

Can water conservation and demand management reduce the need for future expansions of the wastewater plant?

Water conservation helps reduce or delay the need for increased wastewater treatment capacity by reducing average daily flow rates, which are the basis of our wastewater flow projections, but conservation does not reduce the total load of pollutants that must be processed at the plant. The regulatory requirements for wastewater plant capacity are based on maximum monthly flow rates, which are dominated by excess stormwater inflow and infiltration during rainstorms. Reduced water use helps reduce long-term hydraulic needs, but this generally has less effect on future wastewater treatment capacity requirements than it does for drinking water.

Does this mean that correcting more of the I/I problems in the collection system can reduce future expansion needs?

Yes. As noted in the *Capstone Report*, OWASA will pursue this strategy as long as the benefits of deferring the high costs of wastewater treatment plant or sewer interceptor capacity expansion justify the costs of I/I reduction. Another important factor is timing. A successful I/I reduction program requires sustained effort and investment over a number of years before results are realized; but the need to expand treatment plant capacity may be more immediate. OWASA's strategy is to maintain an aggressive, cost-effective I/I reduction program with the long-term goal of deferring future wastewater treatment plant and collection system capacity expansions as much as possible and minimizing the potential for sewer overflows. Figure 16 shows a substantial reduction in



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maximum month (peak) flows at the wastewater plant and may indicate that our efforts to reduce I/I are succeeding.

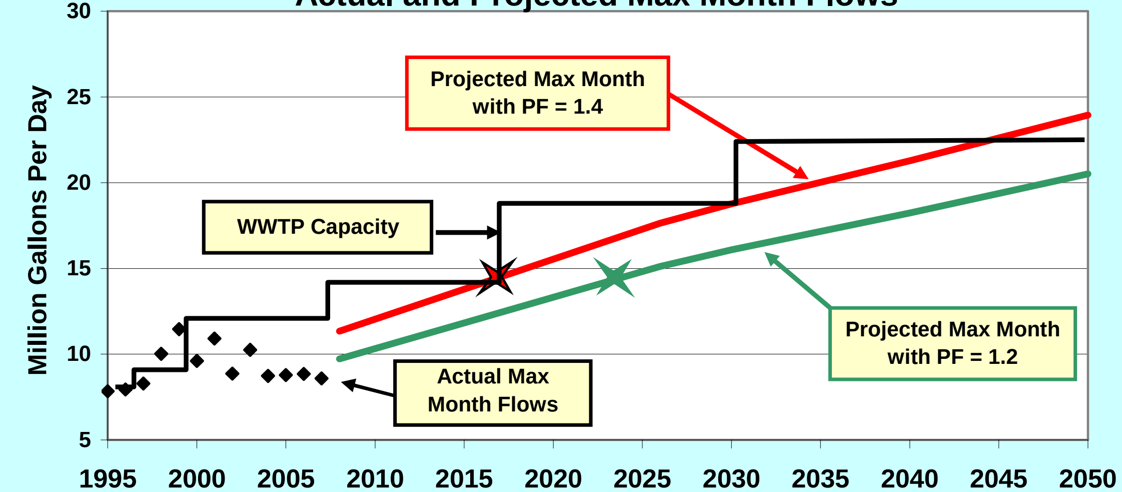
Will the reclaimed water project with UNC reduce the need for future wastewater treatment plant capacity?

No. When implemented, the reclaimed water project will reduce demands on OWASA's reservoirs and drinking water treatment plant, but not on the wastewater plant. With the reclaimed water project, the University will use highly treated effluent from the wastewater plant instead of potable drinking water for the cooling towers of its chilled water facilities. The total amount of wastewater discharged to the sewer system will be the same as if potable water had been used; but, due to evaporative losses from the cooling towers, the total volume of wastewater released from the treatment plant to Morgan Creek will be slightly reduced.

OWASA has just completed a major upgrade and capacity expansion of the wastewater plant. When will the next enlargement be needed?

The recent expansion to 14.5 mgd will provide additional capacity to serve new development anticipated for Carrboro, Chapel Hill, and the University. Based on current projections, this capacity should be adequate to meet the maximum-month flow needs through at least 2016 (please see Figure 17).

Figure 17. Mason Farm Wastewater Plant Capacity vs. Actual and Projected Max Month Flows



The new and upgraded treatment units have already resulted in improved quality of the water released to Morgan Creek; increased plant reliability; eliminated substantial odor problems; and enabled the future reuse of treated effluent to meet non-drinking water needs.

How much wastewater treatment capacity is ultimately required?

The 2001 *Master Plan* projected the eventual need for a 22.5 mgd (maximum month) wastewater plant. Revisions to the University's growth plans discussed earlier would increase ultimate wastewater treatment demand by approximately 3 mgd to a total buildout need of about 25.5 mgd under the original *Master Plan* assumptions, which included a conservative monthly peaking factor of 1.4. OWASA staff believes, however, that the data in Figure 16 justify a lower peaking factor, which results in an ultimate need for approximately 23 mgd of wastewater treatment capacity. The effects of different peaking factors on the timing of wastewater plant expansion are indicated by the stars in Figure 17.

A reduction in the peaking factor to 1.2 could defer the need for plant expansion by about seven years. The recently completed upgrade and expansion project was designed to accommodate the ultimate expansion of the plant on its existing site.

In the future, it may be possible to expand plant capacity by using innovative, advanced treatment technologies, such as retrofitting some or all of the existing aeration basins with membrane filters. OWASA will continue to evaluate the potential need for, applicability, benefits, and costs of such new technologies.

Will the wastewater plant be able to meet the proposed point source nutrient limits for nitrogen and phosphorus upstream of Jordan Lake?

OWASA decided in 2002 that the wastewater treatment plant upgrade and expansion project would include facilities to remove nitrogen and phosphorus to the current limits of technology. Those improvements were recently completed for a cost of about $11 million as part the $50+ million project. Our treatment plant can now remove nitrogen and phosphorus to the proposed regulatory limits – at least until the plant reaches its new capacity of 14.5 mgd. Additional energy and chemicals to achieve the proposed nitrogen limit will cost more than $500,000 per year at current wastewater flow rates, and well over $1 million per year (in today's dollars) when the plant reaches full capacity in the next 10 to 15 years. Without significant advances in nitrogen removal technology, OWASA may not be able to achieve the proposed limit when average day wastewater flows exceed 14.5 mgd, at which time it may be necessary to restrict additional connections to the wastewater system. This information, along with additional comments, was provided to the NC Environmental Management Commission (EMC) at its July 12, 2007 public hearing. The EMC is expected to adopt final rules for Jordan Lake in 2008.

Are there any discretionary treatment or reliability issues – not required by regulations – that OWASA should consider for the future?

The 2001 *Master Plan* identified several discretionary measures which were all included in the recently completed expansion and upgrade project. These included additional electrical generator standby capacity to ensure uninterrupted operation during power outages; filters to provide higher quality effluent (including advanced nutrient removal) and to help meet regulatory requirements for non-potable reuse; ultraviolet disinfection, which is more environmentally friendly than chlorine disinfection; improved capture and use of methane from biosolids treatment to heat boilers and power a blower; and improved odor control to resolve neighborhood issues. Additional opportunities will be considered in the future, such as the use of fuel cell and other alternative energy technologies, and the potential availability of biosolids for use by the general public.

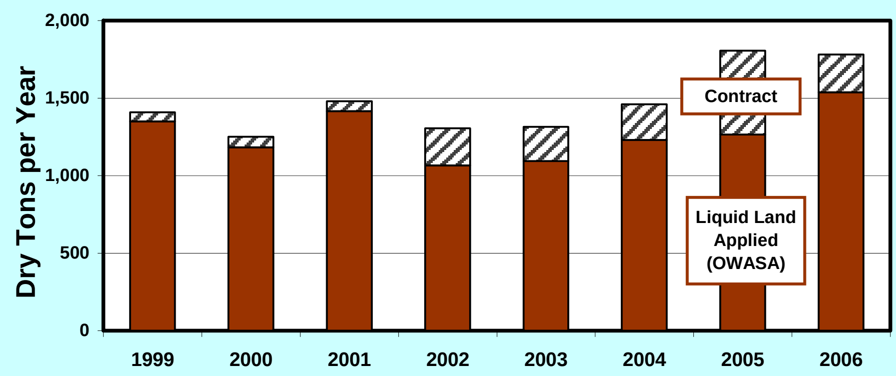
How will we manage the increasing volumes of wastewater biosolids?

The 2001 *Master Plan* included projections of the volume and characteristics of biosolids (highly treated wastewater sludge) generated during the wastewater treatment process and an evaluation of certain alternatives for managing and recycling those biosolids. The *Master Plan* confirmed that our long-standing program of applying liquid biosolids to privately-owned and OWASA-owned farmlands was cost-effective, environmentally sound, and generally acceptable to the public. It identified the need for additional property to ensure that an adequate amount of land remains available for our liquid biosolids recycling program.

Subsequent and more in-depth analyses by OWASA staff, especially the February 3, 2006 discussion paper, *Biosolids Management: Current and Projected Conditions, Issues and Strategies for Ensuring Sustainable Biosolids Management*, indicated that our practice of applying liquid biosolids to agricultural land has become limited by weather conditions, cropping schedules, land availability, increasing biosolids volume, transportation costs, and other operating factors. For the past several years, we have contracted for costly supplemental third-party services, including incineration, landfilling, and composting, to manage an increasing portion of our biosolids production.

As indicated in Figure 18, OWASA's capacity to land apply liquid biosolids with existing staff, equipment, and permitted acreage appears to be in the range of 1,200-1,400 dry tons per year.

Figure 18. Biosolids Production and Management CY 1999-2006



Several external issues and trends, including the possible regulation of phosphorus loading rates to land, may affect the future viability and capability of our management approach and suggest a more diversified program. Staff and Board recognized the need for a long-term *Biosolids Master Plan* through which OWASA can meet its goal of sustainability. The future program will likely comprise a mix of several options and may include land application, composting, thermal drying, and/or other methods. The recently completed installation of biosolids dewatering equipment at the wastewater plant represents a gateway technology for improved flexibility and reliability of OWASA's biosolids program, because dewatering is a necessary next step toward any viable future option. It is likely that the land application of either liquid and/or dewatered biosolids will remain a component of our program until additional methods are available and practical. We recently entered into a five-year contract with a private firm that will provide composting services for our dewatered biosolids and will market the composted end-product.

A draft *Phase I Biosolids Master Plan* was completed this past spring. This will form the basis of a comprehensive long-term biosolids strategy and will discuss the technical options, regulatory issues, markets for biosolids recycling, and overall feasibility of different approaches. The draft plan includes a short list of promising options which will be carefully evaluated.

Future Master Plan Update Reports

Future *Master Plan* narrative updates will be prepared annually and will address additional issues as they emerge. Staff will also provide more detailed strategic data updates on demand trends by major customer category, water and wastewater plant production/treatment trends, and other pertinent information.

Edward A. Holland, AICP
Planning Director